



DRAINAGE DESIGN STRATEGY REPORT

PROJECT

POUND PLACE CARE HOME, ROUNDSTONE LANE, ANGMERING for ARUN DISTRICT COUNCIL

PROJECT NUMBER

18 031

CLIENT

HALLMARK CAREHOMES LTD

REPORT DATE

April 2018 – Second Issue

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DOCUMENT CONTROL

PROJECT NAME	POUND PLACE CARE HOME, ROUNDSTONE LANE
PROJECT NUMBER	18 031
CLIENT	HALLMARK CAREHOMES LTD

REVISION	DATE	WRITTEN BY	REVIEWED BY
Initial issue	MAR 18	MP	MR
Second issue	APR 18	MP	MR

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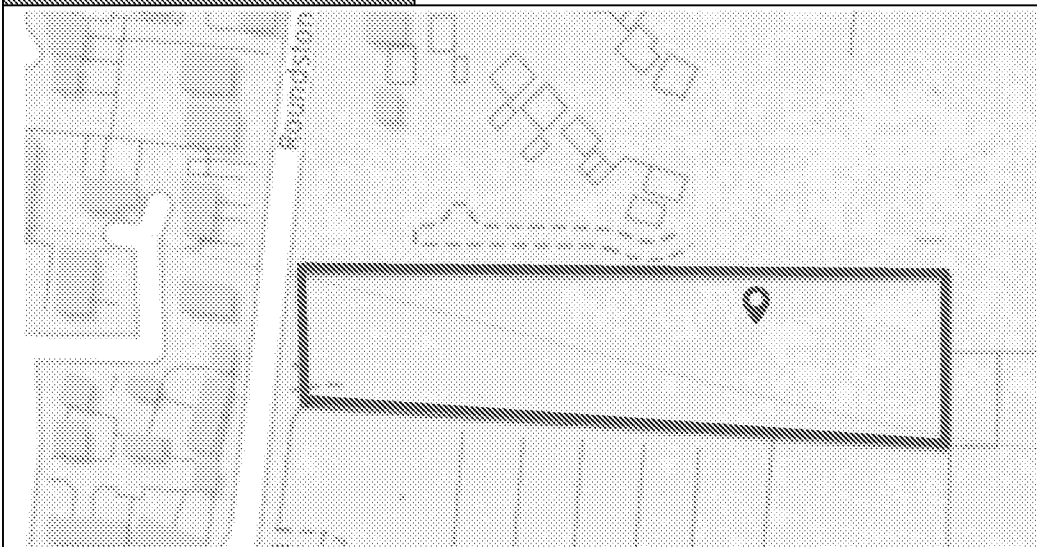
1.0 INTRODUCTION

- 1.1.** Arc Engineers Ltd have been commissioned by Hallmark Carehomes Ltd to provide drainage design for both foul and surface water disposal for the new care home project at on Roundstone Lane, to be referred hereafter as 'the Site'.
- 1.2.** The site is currently occupied by a single house with associated paved areas for parking and garden space. This will be demolished and replaced with a new care home facility. A site layout plan is included in Appendix A.
- 1.3.** This report sets out the investigations undertaken to determine the most appropriate and suitable means of disposing of surface and foul water for the site. The report aims to follow the guidance set out in the following documents.
 - National Planning Policy Framework 2012 (NPPF)
 - National Planning Policy Guidance
 - The SuDS Manual 2015 (CIRIA C753)
 - Approved document H of the Building Regulations
 - Local Authority Strategic Flood Risk Assessment (SFRA)
- 1.4.** The following data was reviewed as part of this assessment.
 - Online Flood mapping
 - British Geological Survey (BGS) on-line maps
 - Ground investigation report – Soakaway results
 - Utility drainage records for the local area.
 - Discussion with local District Council Senior Engineer
 - Discussion with drainage utility provider, Southern Water
- 1.5.** It should be noted that this report sets out the proposed strategy for the actual design of the drainage for the Site. It is not intended to be a Flood Risk Assessment. In this instance ARC Engineers Ltd have been appointed to design the drainage design works for Pound Place. This has been based on information received from the architect, soakaway tests and advice from the district council.

2. SITE APPRAISAL

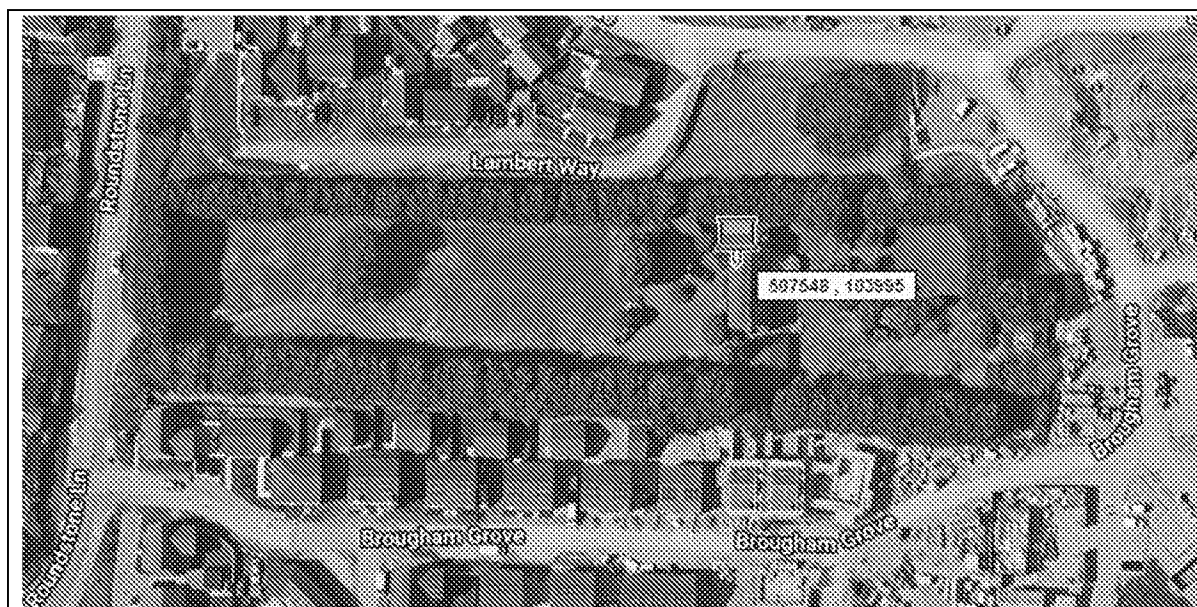
2.1. SITE SETTING

Site Name:	Pound Place, Roundstone Lane, Angmering, Littlehampton, BN16 4AX
Purpose of Development:	New Care Home for Arun District Council
Existing / Former Land Use:	House, garden and hardscaping.
OS NGR:	507548,103995
County:	West Sussex
Local Planning Authority:	Arun District Council
Internal Drainage Board:	N/A



Location Plan

Image produced from the Ordnance Survey map service.



AERIAL PHOTO OF CURRENT / FORMER USE

Image produced from grid-reference-finder

2.2. TOPOGRAPHY

A topographical survey was carried out by archidata on the 16th February 2018. Their drawing indicates that the site slopes from North to South and also slopes down East to West towards Roundstone Lane.

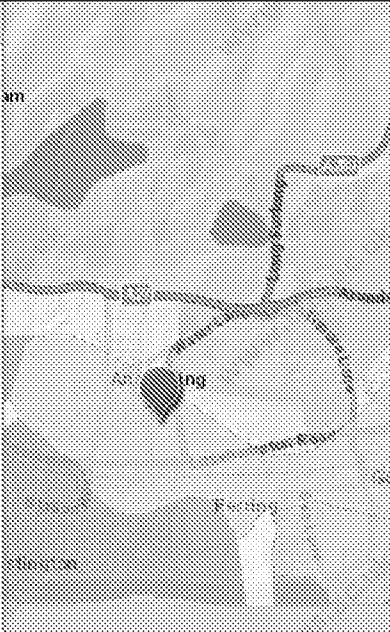
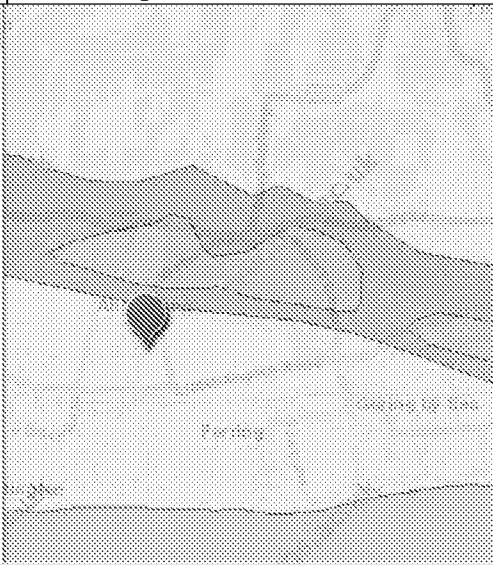
The proposed roof and hardscaped areas will both positively drain into permeable paving, SuDS features and soakaways.

2.3. GEOLOGY

2.3.1. REVIEW OF GROUND INVESTIGATION

Ashdown site investigations have provided soakaway tests which reveal that the ground consists of clay with little to no gravel to a depth of 2m. From the trial pits from 2m to 3m, the ground is very gravelly clay/ very clayey gravel. The tests show that the groundwater level is below 3m as the ground was dry up to 3m.

2.3.2. REVIEW OF BGS RECORDS

Map Key (close this window to activate map) x 1:625 000 scale geology Superficial deposits ☐ ALLUVIUM - CLAY, SILT AND SAND ☒ BRICEARTH - SILT ☐ BLOWN SAND - SAND AND GRAVEL ☐ RAISED MARINE DEPOSITS - SAND AND GRAVEL ☐ RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL ☐ SAND AND GRAVEL OF UNCERTAIN AGE AND ORIGIN - SAND AND GRAVEL ☒ CLAY-WITH-FLINTS FORMATION - DIAMICTON	
Superficial Deposits	Sand and gravel
Map Key (close this window to activate map) x 1:625 000 scale geology Bedrock geology ☒ THAMES GROUP - CLAY, SILT, SAND AND GRAVEL ☒ LAMBETH GROUP - CLAY, SILT, SAND AND GRAVEL ☐ GREY CHALK SUBGROUP - CHALK ☐ WHITE CHALK SUBGROUP - CHALK ☐ GAULT FORMATION AND UPPER GREENSAND FORMATION (UNDIFFERENTIATED) - MUDSTONE, SANDSTONE AND LIMESTONE ☐ LOWER GREENSAND GROUP - SANDSTONE AND MUDSTONE	
Bedrock	Chalk

2.3 PERCOLATION TEST RESULTS

Arun District Council specified that the soakaway tests were to be carried out in winter conditions. Therefore, three soakaway trial pits and five boreholes were tested in winter conditions. These tests showed that the ground is suitable for soakaways to a depth of 3m, the results can be found in the appendices.

2.4. HYDROLOGY

2.4.1. SURFACE WATER FEATURES

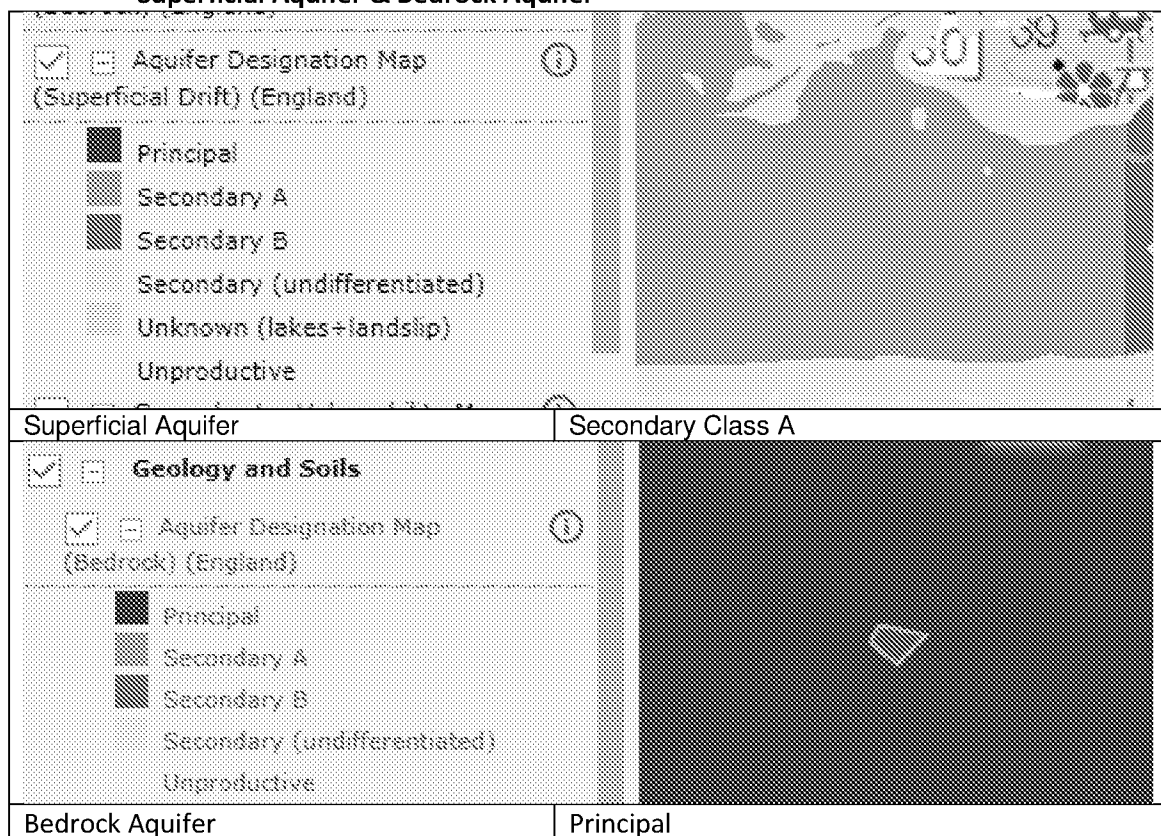
There are no surface water features on site. Nevertheless, it should be noted that Groundsure have written in their Floodview report (reference 17274084) that the site or any area within 50m of the study site are susceptible to pluvial (surface water) flooding.

2.4.2. SURFACE WATERCOURSES

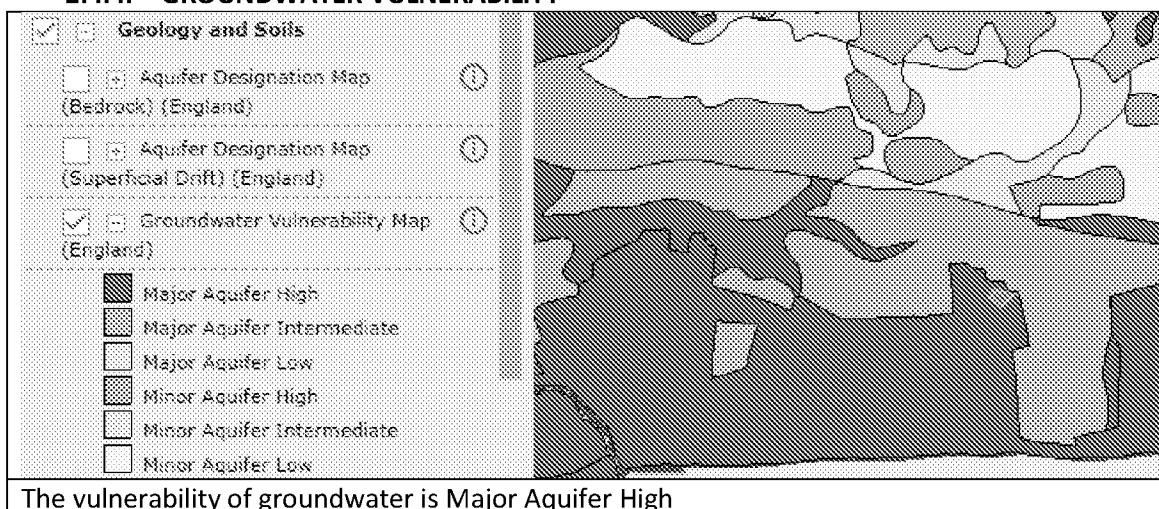
There are no watercourses in the close vicinity to the site.

2.4.3. SITE SENSITIVITY - HYDROLOGY

Superficial Aquifer & Bedrock Aquifer



2.4.4. GROUNDWATER VULNERABILITY



2.4.5. SOURCE PROTECTION ZONE

The site is not within a Source Protection Zone.

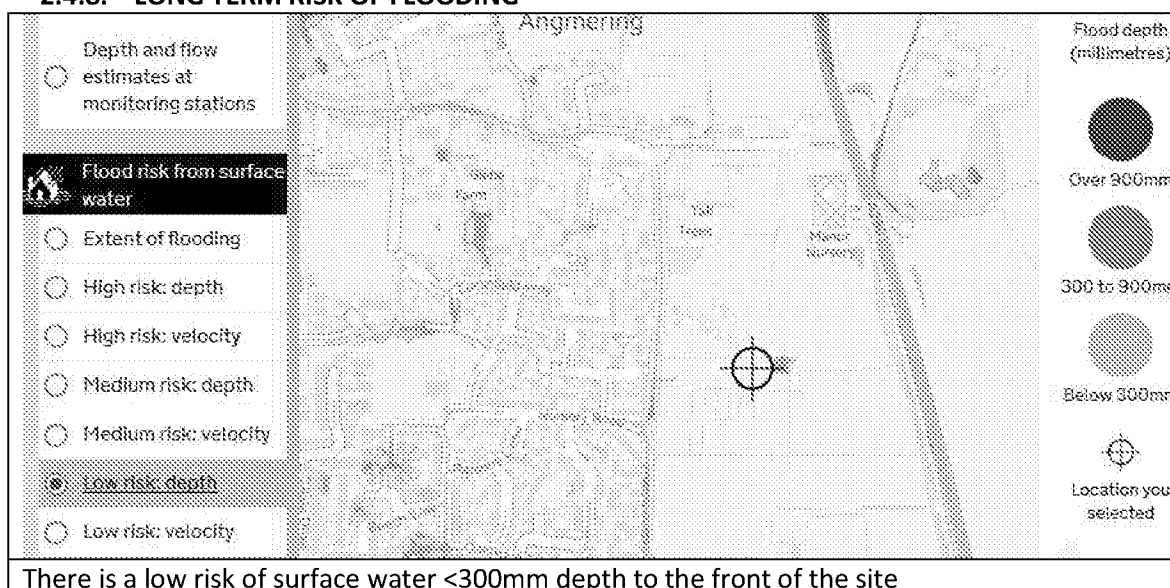
2.4.6. INFILTRATION TESTING

Tests have been carried out according to Arun District Council's suggestion of percolation tests during the winter to see if a soakaway will be suitable for the site. The borehole tests showed that when some 25 litres of water was introduced into the boreholes (up to three times), the water drained away immediately. The results from the trial pits also indicated that the water had been absorbed before the depth of 3m. From these tests, the results show that soakaways will be feasible. (See appendix for soakaway test results)

2.4.7. FLOOD ZONE RISK

The Environment Agency (EA) Flood Map indicates the development site to be located within Flood Zone 1; an area where flooding from rivers and the sea is very unlikely. There is less than 0.1% (1 in 1000) chance of flooding occurring each year. See Appendix D.

2.4.8. LONG TERM RISK OF FLOODING



3. WATER UTILITY RECORDS AND CORRESPONDANCE

- 3.1.** There are no sewer records for the immediate site area. Drawings have been obtained for the sewer to the west of the site area, but these are considered too far away from the immediate site. Southern Water has been contacted to obtain more information about the drainage of the site and immediate surrounding area in Appendix E (on 02/03/18 – by MP). The Senior Engineer at Arun District Council advised that it should be noted that there were no public foul sewers in Roundstone Lane.
- 3.2.** Foul water utility records were found on the council website for the neighbouring development to the north of the site. This showed a foul sewer to run to the east of the site. It is therefore tentatively proposed that the foul drainage will connect to manhole F06 to the east of the site. This connection is to be confirmed by Southern Water. ARC have also communicated with the developers of this neighbouring site to see if more information can be obtained for the existing foul cover and invert levels (Appendix E).

4. CORRESPONDANCE WITH LOCAL AUTHORITY / SFRA

An enquiry was made to Arun District Council on March 2nd 2018 by Arc Engineers to indicate preferred surface water drainage strategies. A response was received from the Senior Drainage and Coastal Engineer of Arun District Council on the 5th March 2018, outlining acceptable means of surface water drainage. The recommendation of utilising soakaways was preferred with other SuDS features such as permeable paving. Also, guidance notes for the methodology of winter percolation tests were distributed by Arun District Council which have been circulated with the Senior Drainage and Coastal Engineer's comments. This outlined that standpipes would not be required for the test and that the percolation test should be carried out to BRE365. A copy of this correspondence is provided in Appendix F.

5. FOUL WATER DRAINAGE STRATEGY

- 5.1.** A gravity only foul drainage connection will be possible from the site, with the internal SVP's directed below ground to shallow inspection chambers around the perimeter of the building. Calculations for foul water flows are provided in Appendix G.
- 5.2.** The proposed site is surrounded by a housing estate that is still being developed. It is understood that the housing development has a new drainage network that runs around the site. The foul drainage will likely connect to the east of the site to manhole F06 at a rate of 6.71 l/s, which is part of the neighbouring development. Refer to Appendix H for the proposed site drainage layout.

6. SURFACE WATER DRAINAGE STRATEGY

- 6.1.** The surface water will be designed to flow into soakaways around the site. The soakaway tests were carried out in winter conditions as specified by Arun District Council (Soakaway test results can be found in the appendices.) There will also be permeable paving for the road and parking bays.

- 6.2.** Arun District Council require that the drainage be designed for 1 in 10 and 1 in 100-year storm events. An allowance of 40% climate change has been applied and as the infiltration rate has been specified to drain 50% of its total volume, a 50% betterment has been included.
- 6.3.** The soakaway tests showed that the ground is suitable for soakaways. Therefore, soakaways will be used for the surface water drainage from the roof, so there will be no discharge into existing sewers. The carpark has an area of 1176m², in the design it has been assumed that the carpark area will be permeable paving.
- 6.4.** The hardstanding roof areas have been divided to indicate where the rainwater will go into each pipe, with a total area of 2318 m². A plan of the divided areas is shown in the appendix.
- 6.5.** The drainage design relies on soakaways; where each network indicated runs into a soakaway. There are 5 soakaways in total. Using the soakaway test results, the percolation rate has been applied to the side of soakaways, the rate for the base has been set as 0m/hr as specified in the requirements by Arun District council.

7. CONCLUSION

- 7.1.** Environment Agency mapping shows that the site is located within Flood Zone 1; with a low risk of flooding. However, from the FRA there is a high risk of groundwater flooding showing Major Aquifer High. As the soakaway results show that the water table is below 3m and has good soil properties of very gravelly clay/ very clayey gravel from 2m to 3m, where the soakaways are located, it is thought that it is unlikely to incur groundwater flooding.
- 7.2.** The site is located in Angmering and is in the remit of Southern Water and Arun District Council. Arun district council have specified that there should be a climate change applied of 40%. They have also specified that the soakaways should drain 50% of its total volume in 24 hours for both 1 in10 and 1 in 100 year storm events.
- 7.3.** The surface water runoff will flow into various soakaways around the site. With an allowance of 40% climate change, and the design has been based on soakaway tests carried out in winter conditions as requested by Arun District Council. The drainage design can be found in the appendices.
- 7.4.** Permeable paving will be used for the carpark and road. As there are no watercourses in close proximity to the site, and the previous land use was a singular house, it is thought that there will be little contamination.
- 7.5.** A gravity only foul discharge has been designed to connect to the existing sewer system found in the housing development that surrounds the site. It is suggested that the foul drainage connect to manhole F06 to the east of the site, at a rate of 6.71 l/s.
- 7.6.** Calculations and corresponding drawings for both the surface water and foul drainage can be found in the appendices in sections G - J.

8. APPENDICES

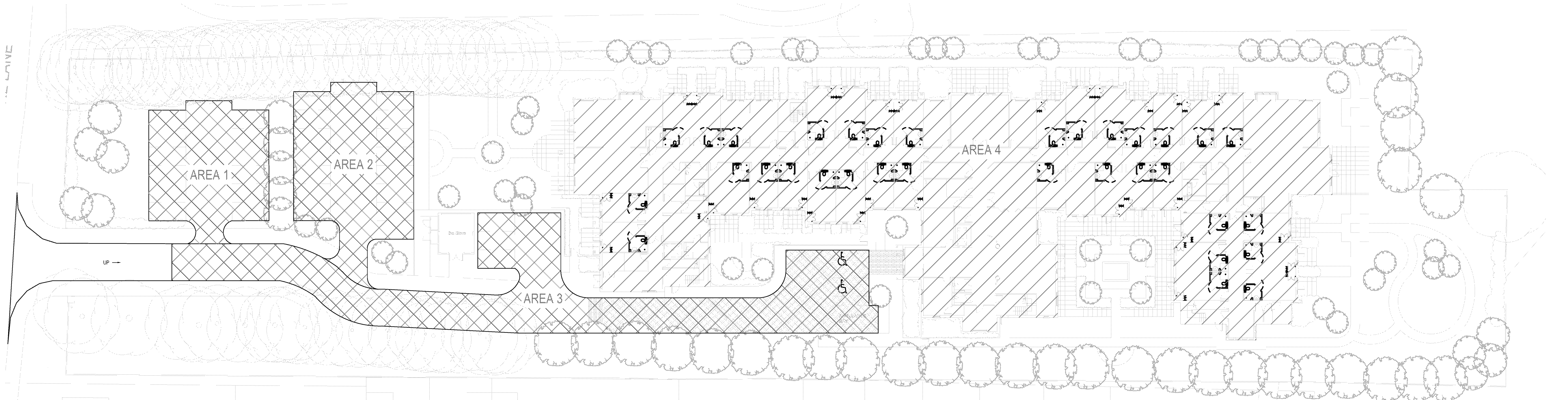
Appendix A Site Layout Plan

DO NOT SCALE

For the avoidance of doubt, no approvals, reviews, comments or indication of satisfaction given by ARC Engineers in terms of subcontract drawings, products or proposed materials shall reduce or extinguish the obligation of the sub-contractor or supplier to adhere to the specification, general arrangement drawings, statutory requirements and good working practice. ARC Engineer's accept no liability for the selection of materials or workmanship in the execution of the works.

General

- These notes are intended to augment drawings and specifications. Where conflict of requirements exists the order of precedence shall be as shown in the specifications. Otherwise the strictest provision shall govern.
- This drawing is to be read in conjunction with all other relevant Engineers and Architects drawings.
- Drawings not to be scaled.
All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer and further instructions obtained before work is commenced.
- The structure is designed to be self-supporting and stable after the building is fully complete. It is the contractors sole responsibility to determine the erection procedure and sequence and ensure that the building and its components are safe during erection. This includes the addition of whatever temporary bracing, guys or tie-downs which may be necessary, such material remaining the property of the contractor upon completion.
- All work to comply to current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of Practice.



SURFACE FINISHES
PERMABLE PAVING
TARMAC/BLOCK PAVING

AREAS
AREA 1 - 250m²
AREA 2 - 315m²
AREA 3 - 611m²
AREA 4 - 2110m²

A	AREAS UPDATED TO SUIT REVISED SITE LAYOUT		AC	
-	INITIAL ISSUE		AC	28.03.2018
REV	DETAIL		BY	DATE
INITIAL ISSUE BASED ON ARCHITECTS DRAWING NUMBER:-				

CONSULTING STRUCTURAL AND CIVIL ENGINEERS

3 CADMAN COURT, LEEDS, LS27 0RX
Phone: 0113 253 3904
www.arc-engineers.co.uk

CLIENT:

PROJECT:

PROPOSED CARE HOME
POUND PLACE
ROUNDSTONE ROAD
ANGMERING

TITLE:

PROPOSED DRAINAGE
SURFACE WATER AREAS

DRAWING STATUS:

INFORMATION ONLY

DRAWN:	DATE:	CHECKED:	DATE:
NB	Mar. 2018	MP	Mar. 2018

SCALE @ A1: 1:250

DRAWING No:	REV:
18 031 S510	A

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Appendix B Extracts of Ground Investigation / Soakaway test results

ALEXANDER

LAMBERT WAY

TP01

TP02

WS02

WS04

TP03

WS01

WS03

WS05

ASHDOWN SITE INVESTIGATION LIMITED

Site: Pound Place, Angmering, West Sussex

Report No.: R18-12844

Sheet No.: 1 of 3

SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

TP01 (Test 1)		TP01 (Test 2)		TP01 (Test 3)	
Time (secs)	Depth to water (m bgl)	Time (secs)	Depth to water (m bgl)	Time (secs)	Depth to water (m bgl)
0	1.90	0	1.10	0	0.96
10	2.13	10	1.54	10	1.40
20	2.33	20	1.85	20	1.67
30	2.54	30	2.13	30	1.84
40	2.73	40	2.34	40	2.00
50	Dry	50	Dry at 2.50*	50	2.16
				60	2.25
				70	Dry at 2.30*
Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 2.80m bgl		Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 2.80m bgl		Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 2.80m bgl	

Remarks: bgl - below ground level.

*Trial pit collapsed during soakage testing.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Pound Place, Angmering, West Sussex

Report No.: R18-12844

Sheet No.: 2 of 3

SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

TP02 (Test 1)		TP02 (Test 2)		TP02 (Test 3)	
Time (secs)	Depth to water (m bgl)	Time (secs)	Depth to water (m bgl)	Time (secs)	Depth to water (m bgl)
0	0.95	0	0.85	0	0.87
10	1.43	10	1.25	10	1.16
20	1.73	20	1.48	20	1.32
30	2.05	30	1.70	30	1.50
40	2.22	40	1.96	40	1.70
50	2.36	50	2.05	50	1.85
60	2.43	60	2.16	60	2.00
90	2.55	90	2.33	90	2.20
120	Dry at 2.60*	120	Dry at 2.40*	120	Dry at 2.40
Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 3.00m bgl		Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 3.00m bgl		Pit Length - 0.45m Pit Width - 1.90m Pit Depth - 3.00m bgl	

Remarks: bgl - below ground level.

*Trial pit collapsed during soakage testing.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Pound Place, Angmering, West Sussex

Report No.: R18-12844

Sheet No.: 3 of 3

SUMMARY OF TRIAL PIT FALLING HEAD SOAKAGE TEST RESULTS

TP03 (Test 1)		TP03 (Test 2)		TP03 (Test 3)	
Time (mins)	Depth to water (m bgl)	Time (mins)	Depth to water (m bgl)	Time (mins)	Depth to water (m bgl)
0	0.50	0	0.54	0	0.51
0.25	0.55	0.5	0.59	1	0.58
0.50	0.60	1	0.61	2	0.60
1	0.63	2	0.64	8	0.66
2	0.63	4	0.68	14	0.70
3	0.64	8	0.74	24	0.74
4	0.65	12	0.79	35	0.77
8	0.68	16	0.82	48	0.79
16	Dry at 0.75*	22	0.85	50	Dry
		28	Dry		
Pit Length - 0.30m Pit Width - 0.30m Pit Depth - 0.90m bgl		Pit Length - 0.30m Pit Width - 0.30m Pit Depth - 0.90m bgl		Pit Length - 0.30m Pit Width - 0.30m Pit Depth - 0.90m bgl	

Remarks: bgl - below ground level.

*Trial pit collapsed during soakage testing and cleared to 0.90m before start of second test.

ASHDOWN SITE INVESTIGATION LIMITED

Site: Pound Place, Angmering, West Sussex

Report No.: R18-12844

Sheet No.: 1 of 1

SUMMARY OF BOREHOLE FALLING HEAD SOAKAGE TEST RESULTS

WS03		WS04	
Time (mins)	Depth to water (m bgl)	Time (mins)	Depth to water (m bgl)
0	*	0	*
Borehole Depth (m bgl)	3.00	Borehole Depth (m bgl)	3.00
Casing Depth (m bgl)	2.00	Casing Depth (m bgl)	2.00
Borehole Diameter (mm)	92.00	Borehole Diameter (mm)	92.00
Casing Diameter (mm)	105.00	Casing Diameter (mm)	105.00

Notes: bgl – below ground level.

*25 Litres of water introduced into the borehole three times which drained away instantly each occasion.

Appendix C EA Map of Flood Risk Zone

Flood map for planning

Your reference
Pound Place

Location (easting/northing)
507548/103995

Created
29 Mar 2018 1:58

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Flood map for planning

Your reference

Pound Place

Location (easting/northing)

507548/103995

Scale

1:2500

Created

29 Mar 2018 1:58



Selected point

Flood zone 3



Flood zone 3: areas
benefitting from flood
defences



Flood zone 2



Flood zone 1



Flood defence



Main river



Flood storage area



Page 2 of 2



Appendix D Correspondence with Arun District Council

Morwenna Parkin

From: Paul Cann <[REDACTED]>
Sent: 07 March 2018 10:26
To: Morwenna Parkin
Cc: Andrew Rimmington
Subject: RE: Planning Consultation - PAA/108/16

Morwenna

On this size development, standpipes are not required for groundwater monitoring or the percolation testing.

Hopefully, you have found groundwater data from the adjacent developments?

Percolation tests to BRE365 can be carried out next week, at an agreed depth.

Regards

Paul Cann
Senior Engineer (Drainage & Coastal)

From: Morwenna Parkin <[REDACTED]>
Sent: 07 March 2018 09:12
To: Paul Cann
Cc: Andrew Rimmington
Subject: RE: Planning Consultation - PAA/108/16

Good morning Paul,

We are starting to look at site investigation for the project.

The table below shows the items needed for standpipe installations, which are being considered for the site investigation.

Standpipe Installations

Supply perforated or un-perforated HDPE tube with an internal diameter up to **50mm** capped top and bottom required to form a piezometer or standpipe (exclusive of annulus backfill materials).

Supply bentonite, or similar material, to form seal to standpipe installation up to **50mm** diameter within boreholes up to 100mm diameter.

Supply pea gravel, or similar material, to form annulus to standpipe installation up to **50mm** diameter within boreholes up to 100mm diameter.

Supply and install protective cover small flush set in concrete

Are standpipes required by Arun District Council or are the soakaway tests being carried out next week in winter conditions adequate?

Thank you in advance

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE



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From: Paul Cann [REDACTED]
Sent: 06 March 2018 14:40
To: Morwenna Parkin [REDACTED]
Subject: RE: Planning Consultation - 17/18/19

Morwenna

I think it will be a case at looking at the planning system to identify the consultant details/foul drainage details. Please note that there were no public foul sewers in Roundstone Lane before the developments.

Paul Cann
Senior Engineer (Drainage & Coastal)

Paul Cann | Senior Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor, Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF

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Arun is Working in Partnership with Chichester District Council

Visit Arun's web site at <http://www.arun.gov.uk/> and www.chichester.gov.uk



Save the environment - think before you print.

From: Morwenna Parkin [REDACTED]
Sent: 06 March 2018 14:18
To: Paul Cann
Cc: Andrew Rimmington
Subject: RE: Planning Consultation - PAA/108/16

Hi Paul

Yes no problem, would you be able to pass on the contact details for the consulting engineers on the other developments please?

The reason I tried to call earlier was to try to gain some information on the foul drainage. On the existing drawings we've been shown there is no foul drainage to the north or south of the immediate site area. I wanted to know how the other developments to the north and south had been serviced? I assume that there is a foul drain nearby that could be used?

Any information that you could give me on this would be extremely helpful, thanks for your help so far

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE
[REDACTED]



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From: Paul Cann <[REDACTED]>
Sent: 06 March 2018 14:18
To: Morwenna Parkin [REDACTED]
Subject: RE: Planning Consultation - PAA/108/16

Hi Morwenna

Unfortunately, I haven't got time to look into this. May I suggest contacting the consulting engineers on the other developments to see if they are able to provide you with the data?

Regards

Paul Cann
Senior Engineer (Drainage & Coastal)

[REDACTED]



From: Morwenna Parkin [REDACTED]
Sent: 05 March 2018 17:15
To: Paul Cann
Subject: RE: Planning Consultation - PAA/108/16

Hi Paul,

Thanks you for sending on the guidance notes for SuDS,
We haven't got the highest recorded ground water level for the site area, please could you help us to find this?

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE
[REDACTED]



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Registered in England & Wales, Company Number 6365566

From: Paul Cann [REDACTED]
Sent: 05 March 2018 13:12
To: Morwenna Parkin [REDACTED]
Subject: RE: Planning Consultation - PAA/108/16

Morwenna

I would suggest that you give a ring to discuss the surface water drainage requirements.

Regards

Paul Cann
Senior Engineer (Drainage & Coastal)

[REDACTED]

From: Amanda Scholes **On Behalf Of** Planning.Responses
Sent: 05 March 2018 09:21
To: Paul Cann
Subject: FW: Planning Consultation - PAA/108/16

From: Morwenna Parkin [REDACTED]
Sent: 02 March 2018 12:14
To: Planning.Responses
Cc: Andrew Rimmington
Subject: Planning Consultation - PAA/108/16

Dear Planning Officer,

I am a Project Engineer at arc engineers currently working on a the drainage strategy for a proposed care home at Pound Place, Angmering, BN16 4AX.

Our proposed approach will be permeable paving, SUDS features and soakaways as there appears to be no surface water sewer, which should be suitable with the granular ground conditions.

I also understand that Arun council would like soakaway tests to be carried out in winter conditions, which we hope to carry out as soon as possible.

Please could you give futher input into any concerns/ preferences you have with the drainage and anything else that you would like in respect of drainage?

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE
[REDACTED]



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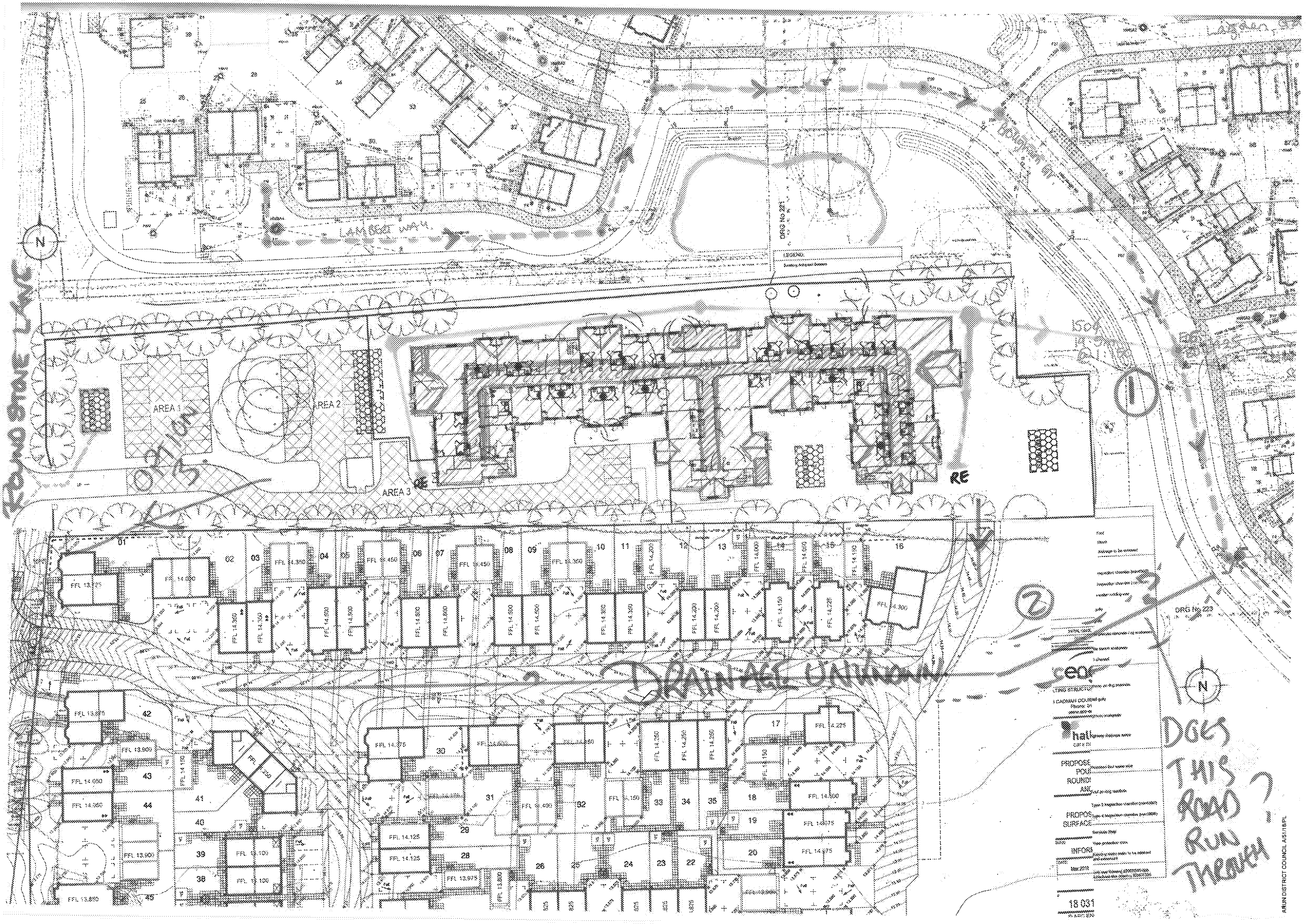
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<http://www.arun.gov.uk>

NLPG UPRN 100062237016
DX 57406 Littlehampton

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Appendix E Sewer Records & Contact



DOES
THIS
ROAD
RUN
THROUGH?

18-031



Cornerstone Projects Ltd
91
Market Street
Wirral
CH47 5AA

Your ref ANG
Our ref 281024
Date 15 February 2018
Contact searches@southernwater.co.uk
Tel 0845 272 0845
 0330 303 0276
Fax 01634 844514

Attention: Jake Hughes

Dear Customer

Re: Provision of public sewer and water main record extract

Location: Pound Place, Littlehampton, BN16 4AL

Thank you for your order regarding the provision of extracts of our sewer and/or water main records. Please find enclosed the extracts from Southern Water's records for the above location.

We confirm payment of your fee in the sum of £49.92 and enclose a VAT receipt for your records.

Customers should be aware that there are areas within our region in which there are neither sewers nor water mains. Similarly, whilst the enclosed extract may indicate the approximate location of our apparatus in the area of interest, it should not be relied upon as showing that further infrastructure does not exist and may subsequently be found following site investigation. Actual positions of the disclosed (and any undisclosed) infrastructure should therefore be determined on site, because Southern Water does not accept any responsibility for inaccuracy or omission regarding the enclosed plan. Accordingly it should not be considered to be a definitive document.

Should you require any further assistance regarding this matter, please contact the LandSearch team.

Yours faithfully

LandSearch

104107



103865

507271

LEGEND - MAINS

- | | | | |
|--|--|--|------------------------------------|
| | Distribution Main / Communication pipe | | Clockwise closing valve |
| | Trunk Main | | Fire Hydrant |
| | Raw water main | | Washout |
| | Non potable | | Washout hydrant |
| | Abandoned main | | Meter |
| | Proposed Main | | Capped end |
| | Fire main | | Emptying plug |
| | Non SWS | | Stopcock |
| | Sluice valve | | Leak Noise Correlator Survey Point |
| | Closed valve | | Anode |
| | Air valve | | Telemetry cable |
| | Butterfly valve | | Access point / hatchbox |
| | Pressure reducing valve | | |
| | Reflux valve | | |
| | Motorised valve | | |

WARNING: SAC pipes are constructed of Bonded Asbestos Cement

MATERIALS

- | | | | |
|--|----------------------------|--|------------------------------------|
| | Dialysis machine | | Alkathene |
| | Break pressure tank | | Cast iron |
| | Change node | | Spun (grey) iron |
| | Pumping station | | Concrete |
| | Booster station | | Ductile iron |
| | Insertion Flow Meter Point | | Bonded Asbestos Cement |
| | Water tower | | Glass reinforced plastic |
| | Service reservoir | | Glass reinforced epoxy |
| | Water Supply Works | | (Unplasticised) Polyvinyl chloride |
| | Bore hole / Well | | Polyethylene |
| | Intake | | Steel |
| | Customer site | | Concrete segments bolted |
| | Swab insertion point | | Concrete segments unbolted |
| | | | Galvanised iron |
| | | | Ductile sleeve |
| | | | Concrete pre-stressed |
| | | | High performance polyethylene |
| | | | Unknown |

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement

AK	Drawn by:	yadavs
CI	Scale:	1:1250
SI	Date:	15/02/2018
CO	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd. accept no responsibility in the event of inaccuracy. The actual positions of pipes should be determined on site.	
DI		
BAC	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.	
GRP		
GRE		
PVC		
PE		
ST		
CSB		
CSU		
GI		
DS		
CPS		
HPE		
??		

O.S.Ref: TQ0703NE

TITLE: 281024_Pound Place, Littlehamp

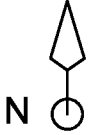
507752

SEWER RECORDS PAGE 1 OF 2

104130



103842

507276	O.S. REF. TQ0703NE	Drawn by: yadavsa	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement	 
	Title: 281024_Pound Place, Littlehamp	Scale: 1:1250		
		Date: 15/02/2018	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.	

507747

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
2007X	14.42	12.33	150	VC	CIRC																		
2008X	14.3	12.22	150	VC	CIRC																		
2009X	14.906	12.746	150	VC	CIRC																		
200DX			UNK	VC	CIRC																		
2010X	14.971	12.906	150	VC	CIRC																		
2055X	15.031	13.4	300	VC	CIRC																		
2056X	14.816	14.061	150	VC	CIRC																		
2154X	14.911	13.301	300	VC	CIRC																		
2856X	13.22	10.67	375	CO	CIRC																		
2901X	13.98	9.84	150	VC	CIRC																		
2902X	14	9.68	150	VC	CIRC																		
2905X	14.47	12.04	150	VC	CIRC																		
2909X	13.6	10.09	150	VC	CIRC																		
2950X	13.96	10.43	600	CP	CIRC																		
2951X	14.075	10.4	600	CP	CIRC																		
2953X	14.44	12.58	225	VC	CIRC																		
2956X	13.76	10.56	375	CO	CIRC																		
3001X	14.71	12.84	150	VC	CIRC																		
3002X	15.121	13.058	150	VC	CIRC																		
3003X	15.276	13.22	150	VC	CIRC																		
3004X	15.126	13.33	150	VC	CIRC																		
3050X	14.51	13.01	150	VC	CIRC																		
3051X	14.58	13.23	150	VC	CIRC																		
3052X	15.216	14	150	VC	CIRC																		
3053X	15.276	13.75	225	VC	CIRC																		
3054X	15.141	13.895	150	VC	CIRC																		
3801X	13.05	10.27	150	VC	CIRC																		
3802X	12.83	11.33	150	VC	CIRC																		
3850X	13.05	10.72	375	CO	CIRC																		
3851X	12.34	10.92	375	CO	CIRC																		
3852X	12.92	10.77	375	CO	CIRC																		
3901X	13.48	11.05	150	VC	CIRC																		
3902X	14.04	10.83	150	VC	CIRC																		
3903X	14.43	12.22	150	VC	CIRC																		
3904X	14.17	11.72	150	VC	CIRC																		
3905X	14.15	11.62	150	VC	CIRC																		
3906X	13.91	11.5	150	VC	CIRC																		
3907X	13.48	11.29	150	VC	CIRC																		
3908X	14.4	11.91	150	VC	CIRC																		
3909X	14.21	11.7	150	VC	CIRC																		
3950X	13.44	11.86	450	CP	CIRC																		
3951X	14.34	12.4	300	CO	CIRC																		
3952X	14.14	12.19	375	CO	CIRC																		
3953X	13.9	12.12	375	CO	CIRC																		
3954X	14.44	12.83	225	VC	CIRC																		
3955X	13.69	12	450	CO	CIRC																		
3956X	13.51	11.91	450	CO	CIRC																		

LINE STYLES / COLOURS

Brown	-----	Foul
Dark Blue	-----	Foul Siphon Sewer
Purple	-----	Foul Vacuum Main
Red	-----	Foul Rising Main
Orange	-----	Combined
Dark Blue	-----	Combined Siphon Sewer
Purple	-----	Combined Rising Main
Light Blue	-----	Lateral Drain
Yellow	-----	Building Over Agreement Area
Green	-----	Treated Effluent
Dark Blue	-----	Sludge
Purple	-----	Sewer Catchment
Light Blue	-----	Section 104 Area
Yellow	-----	Surface Water
Green	-----	Surface Water Rising Main
Dark Blue	-----	Private
Purple	-----	Access Shaft
Light Blue	-----	Decommissioned

MATERIALS

AK	Alkaline
BAC	Bonded Asbestos Cement
BRD	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRD	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Verified Clay
XXX	Other
ZZZ	Unknown

Manhole (SW)
Manhole (F&C)
Lamp hole (SW)
Lamp hole (F&C)
Pumping Station (SW)
Pumping Station (F&C)
Side entry manhole (SW)
Side entry manhole (F&C)
Blind shaft (SW)
Blind shaft (F&C)
Ejector station (SW)
Ejector station (F&C)
Watertight door (SW)
Watertight door (F&C)
Flushing ch. Min-e (SW)
Flushing ch. Min-e (F&C)
Flushing ch. No-e (SW)
Flushing ch. No-e (F&C)
Demonstration Chamber

LEGEND - SEWERS

Washout (SW)
Washout (F&C)
Rodding Eye (SW)
Rodding Eye (F&C)
Gauging point (SW)
Gauging point (F&C)
Intercept chamber (SW)
Intercept chamber (F&C)
Storm Tank (SW)
Storm Tank (F&C)
Vortex chamber (SW)
Vortex chamber (F&C)
Label ellipse
Dummy/S24 manhole
Outfall
Penstock chamber
Demiboards
Storm Overflow
Backdrop manhole

Other (s)
Other
Change In sewer (s)
Change In sewer
Flap valve
Cascade
Anode
Valve
Closed Valve
Air Valve
Hatch box (SW)
Hatch box (F&C)
Direction arrow
Emptying valve
Catchpit
Soakaway
Inlet
Balancing Pond

Wastewater treatment works
Marine treatment works
Outfall headworks
Vent
Vent column
Tidal storage tank
Blank end
Head of Public Sewer
Micro Pumping Station

SHAPES (S)
A Arched
B Barrel
C Circular
E Egg
H Horseshoe
R Rectangular
S Square
T Trapezoidal
U U Shape
X Other

NODE REFERENCING SYSTEM
1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
4th digit: next sequential node

Drawn by: yadavs

Title: 281024_Pound Place, Littlehamp

Date: 15/02/2018





LEGEND:

Existing Adopted Sewers

- Existing Foul
- Existing Storm
- Existing drainage to be removed

Private Storm Drainage

- S3 Type 3 inspection chamber (min4500)
- S4 Type 4 inspection chamber (min1800)
- RE Surface water rodding eye
- RG Road gully
- YG Yard gully
- PSA Private precast concrete ring soakaway
- Private trench soakaway
- ACO ACO channel

Highway Drainage for Adoption

- HW Highway pc ring manhole
- RG Road gully
- HWSA Highway soakaway
- Highway drainage swale

Private Foul Drainage

- Proposed foul water pipe

Foul Sewers for Adoption

- Backdrop Foul pc ring manhole
- F3 Type 3 inspection chamber (min4500)
- F4 Type 4 inspection chamber (min1800)

Service Gaps

- Tree protection zone
- Existing water main to be retained and easement

NOTES:

For drainage construction details see drawing 2206/500-505
For manhole and soakaway schedules see drawing 2206/7228



NOTES:

- All dimensions to be checked on site. All details and dimensions relating to sub-contractors work must be checked and agreed between the sub-contractor and supplier and the general Contractor.
- This drawing is to be read in conjunction with all relevant Architects and Engineer's drawings and specification.
- The main Contractor is responsible for ensuring the stability of the structure whilst the works are in progress.
- Any information given regarding existing underground services is given in good faith after consultation with the relevant authority. No liability is accepted by the Consultant and the main Contractor is responsible for obtaining and checking all information and taking due care and attention whilst undertaking the works.
- All pipes, bends and junctions shall be vitrified clay to BS EN 205-1, with flexible joints and literature certified. Alternatively all pipes and fittings can be UPVC conforming to BS EN 1401-1 and shall be laid in accordance with the manufacturers specification. If UPVC pipes are to be used then the manufacturer shall be approved by the Engineer prior to construction.
- All adoptable sewers shall be in strict accordance with the current edition of Sewers For Adoption. Unless otherwise stated, adoptable sewers shall be 150mm diameter and shall be laid in a class 3 bedding. Where the depth to soffit is less than 1.2m under a public highway or 0.8m elsewhere the pipe shall be laid with a class 2 bedding.
- All private building drainage shall be constructed in strict accordance with BS EN 752:1996. Unless otherwise specified building drainage shall be 100mm diameter and shall be laid in a minimum gradient of 1 in 40 for foul drains and 1 in 60 for surface water drains. All building drains shall be laid in class B bedding unless otherwise specified.
- Where a pipe is within 1m of a foundation the trench shall be filled with class GEN 2 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN 3 concrete to a level below the lowest level of the foundation equal to the distance from the foundation less 150mm. In both cases the pipe shall be bedded and surrounded in 150mm thick class GEN 3 concrete.
- Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN 3 concrete encasement (150mm thick) in all other cases the pipes shall be bedded and surrounded with 150mm thick granular material.
- In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided. Compressible boards (fibreglass or polystyrene) shall be provided at a maximum of 4m centres (coinciding with pipe joints). The boards shall be pre-cut to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 15mm for pipes up to 450mm nominal diameter and 20mm for pipes over 450mm nominal diameter.
- All steps shall have ridding access plates fitted at their bases (ground floor level).
- Where existing pipes are to be abandoned they shall be dug out together with any abandoned manholes.

Issue Status

REV	DATE	BY	DESCRIPTION	CHK
D1	02.09.14	AJD	Drainage updated to suit new tree in yard	
C	06.08.14	AJD	Drainage updated to suit 'Value Engineering' comments. Site layout updated to suit current external works	
B	22.07.14	AJD	Highway drainage design and private trench soakaway size updated to suit new soakaway rate	
A	17.06.14	AJD	Drainage updated	

TENDER

11 Tungsten Building
George Street
Fishergate
Sussex
BN4 1 BA
Tel: 01273 424824
Fax: 01273 424425
email: design@civil.co.uk

the Civil Engineering Practice

CLIENT: Barratt David Wilson Southampton

PROJECT: Swanbourne Park Angmering

TYPE: Site Layout
Proposed Drainage
Sheet 3 of 4

DRAWN: A Davies **DATE:** May 2014 **PROJECT NO:** 22067

DESIGNED: A French **CHECKED:** **DATE:** **REV NO:** 223 **REV:** D

SCALE: 1:250 @ A1



Thank you in advance

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE
Tel - 0113 253 3904



CONSULTING CIVIL & STRUCTURAL ENGINEERING DES

Morwenna Parkin

From: Morwenna Parkin
Sent: 28 March 2018 09:31
To: 'stuart@civil.co.uk'
Cc: Andrew Rimmington
Subject: Foul drainage levels - Angmering
Attachments: Site plan & proposed drainage 3 of 4-swanbourne park angmering.pdf

Hi Stuart,

Thank you for talking to me on the phone just now

As I explained, I am looking into the drainage strategy for a site in proximity to the developments for Swanbourne Park by CEP.

Please would it be possible to get the cover levels and invert levels (possibly in CAD format) for foul drains F05, F06 and F07?

I have highlighted these below from the drawing (attached) from the government website of foul drainage:

Morwenna Parkin

From: Morwenna Parkin
Sent: 02 March 2018 16:47
To: 'searches@southernwater.co.uk'
Subject: ref: 281024

Dear Southern Water,

Previously sewer records were received for Pound Place, Littlehampton, BN16 4AL (ref 281024)
However this map does not indicate that there is any foul drainage in close proximity to the site.

Are there any further records that you can give or suggest a suitable connection point that would be good for pound place please?

Kind regards,
Morwenna Parkin
Project Engineer
MEng BEng (INT) Hons GMICE
Tel - 0113 253 3904



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Registered in England & Wales, Company Number 6365566

Appendix F Arun District Council - Supplementary Requirements for SW Drainage Proposals



Supplementary Requirements for Surface Water Drainage Proposals

Any proposed surface water scheme must consider sustainable drainage principles.

SuDS Selection

The following destinations must be considered for surface runoff in order of preference:

1. Discharge into the ground (infiltration);
2. Controlled discharge to a surface water body;
3. Controlled discharge to a surface water sewer.

Surface water must not be discharged into the foul sewer system. Infiltration structures include soakaways, basins, swales and permeable paving. Discharge to surface water bodies and surface water sewers must be restricted to an agreed rate.

SuDS selection hierarchy based on:

CIRIA C753 - The SuDS Manual

BS8582:2013 – Code of Practice for Surface Water Management for Development Sites

Approved Document H of the Building Regulations

Infiltration Drainage Design

Infiltration rates for soakage structures are to be based on percolation tests undertaken in the winter period at the location and depth of the proposed structures. The percolation tests must be carried out in accordance with BRE 365, CIRIA R156 or a similar approved method, and cater for the 1 in 10 year storm event between the invert of the lowest entry pipe into the infiltration structure and the base. For the purpose of design, the percolation rate must be applied to the sides of the infiltration structure only and the rate for the base must be zero. This does not apply to infiltration basins or permeable pavements, whereby the percolation rate is applied to the base only. There must be provision to ensure that there is capacity in the system to contain the 1 in 100 year storm event plus 40% on stored volumes, as an allowance for climate change. The infiltration structure should also drain 50% of its total volume in 24 hours or less for both the 1 in 10 and 1 in 100 year (plus 40%) storm events, in order to provide spare capacity for subsequent storms.

Any infiltration drainage design must include adequate winter groundwater monitoring data to determine the highest winter groundwater table. Residential developments in excess of five properties will require ground water monitoring to be carried out between October and March inclusive. The extent of monitoring required for smaller developments will be subject to agreement with the Council's Engineers.

Adequate freeboard must be provided between the base of the soakaway structure and the highest recorded groundwater level identified in that location.

Restricted Discharge

Discharge to a watercourse or surface water sewer must be restricted to the estimated mean greenfield runoff rate (Q_{bar}) by means of a controlled outflow (or restricted to existing runoff rates for brownfield sites). This can be derived from IH124 or a similar approved method. Any storage design must be submitted with groundwater monitoring data where applicable to ensure there will be no detrimental effect on the structure or storage. Storage areas are preferred to be in an 'open' form such as ponds, rather than underground tanks.

Flow Exceedance Routes

The drainage design should show flow routes through the proposed development, demonstrating where surface water will be conveyed for three types of flow:

1. Low flow routes

Regular flow from source control features such as permeable pavements should travel in low flow channels through the development in a controlled way contributing to landscape quality.

2. Overflows

In the event of local blockages or surcharge a simple overflow arrangement should allow water to bypass the obstruction and return to the management train sequence until conditions return to normal.

3. Exceedance routes

When SuDS are overwhelmed by exceptional rainfall, then exceedance routes are required to protect people and property. These provide unobstructed overland flow routes from the development and should be considered for all drainage schemes. Exceedance routes should also be protected from future changes in land use.

Culverting a Watercourse

Culverting (piping) a watercourse is not advised unless there is no alternative. The resulting reduction in storage volume, flow capacity and habitat potential would be unacceptable. Culverted watercourses are also more difficult to maintain due to the limited accessibility.

Land Drainage Consent must be sought from the Lead Local Flood Authority (West Sussex County Council), or its agent (Arun District Council – land.drainage@arun.gov.uk), prior to starting any works (temporary or permanent) that affect the flow of water in the watercourse. Such works may include culverting, channel diversion and the installation of trash screens.

The development layout must take account of any existing watercourses (open or culverted) to ensure that future access for maintenance is not restricted.

See also:

Land Drainage Act 1991 (amended 1994)

Maintenance and Management

Ditches and watercourses (including culverts) should retain a three metre easement with access that allows for its future maintenance.

Details of the maintenance and management of the SuDS system are to be set out in writing in a site specific maintenance manual. This manual shall include details of the financial management and arrangements for the replacement of components at the end of the manufacturers recommended design life. This document is then to be submitted as part of the planning process.

References

The Building Regulations 2000
Drainage and waste disposal
Approved document H
ISBN: 1-859462-08-1

Building Research Establishment,
Soakaway Design – Digest 365 (BRE 365)
ISBN: 1 86081 604 5, 1991

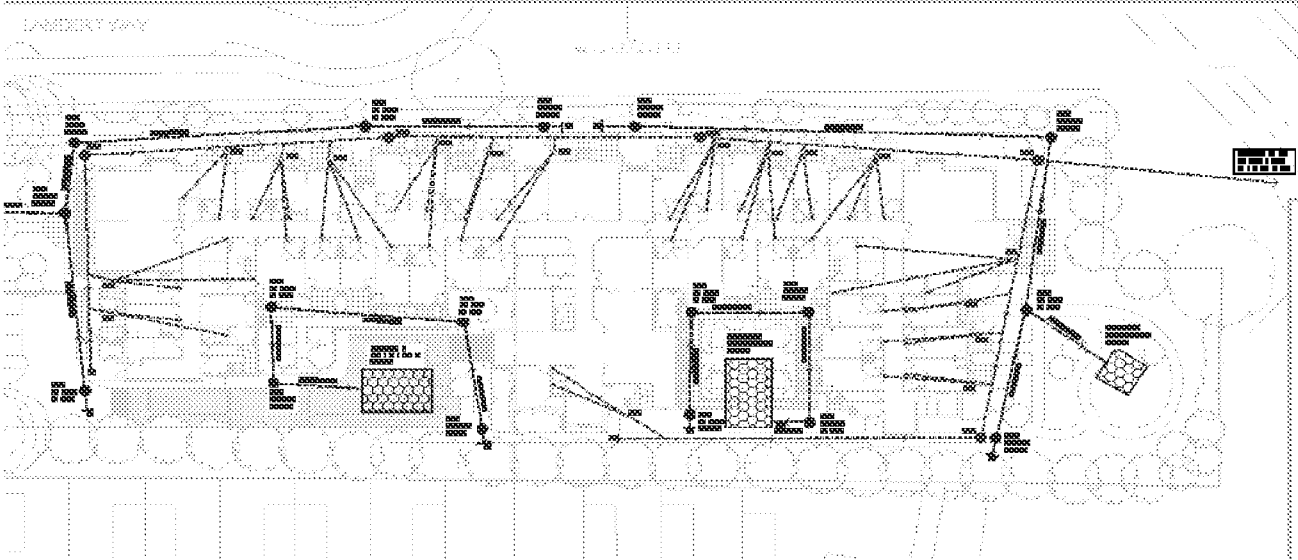
Centre for Ecology and Hydrology
Flood Estimation for Small Catchments - IH Report 124
Marshall, D.C.W. & Bayliss, A.C.
ISBN: 0948540621, 1994

CIRIA
C697 The SUDs Manual
Woods-Ballard, B.; Kellagher, R. et al
ISBN: 978-0-86017-697-8, 2007

CIRIA
R156 Infiltration Drainage – Manual of Good Practice
Bettess, R.
ISBN: 0 86017 457 3

British Standards Institution
BS8582:2013 – Code of Practice for Surface Water Management for Development Sites
ISBN: 978 0 580 76700 5

Appendix G Foul Water Drainage Calculations

		Project:				
		Pound Place Angmering				
		Details:			Project Number:	
Foul Drainage Calculations			18 031			
Produced By:	Date:	Checked By:	Date:	Section/Page No/Revision		
MP	Mar-18	JB	Mar-18	1 / 1		
Ref.	Calculations				Output	
						

		Project:			
		Pound Place Angmering			
		Details:		Project Number:	
		EXTRACTS OF BUILDING REGS		18 031	
Produced By:	Date:	Checked By:	Date:	Section/Page No/Revision	
MP	Mar-18			1 / 2	
Ref.	Calculations				Output

RELEVANT EXTRACTS FROM APPROVED DOCUMENT H1 (as of May 2016)

Diagram 9 Discharge capacities of foul drains running 0.75 proportional depth

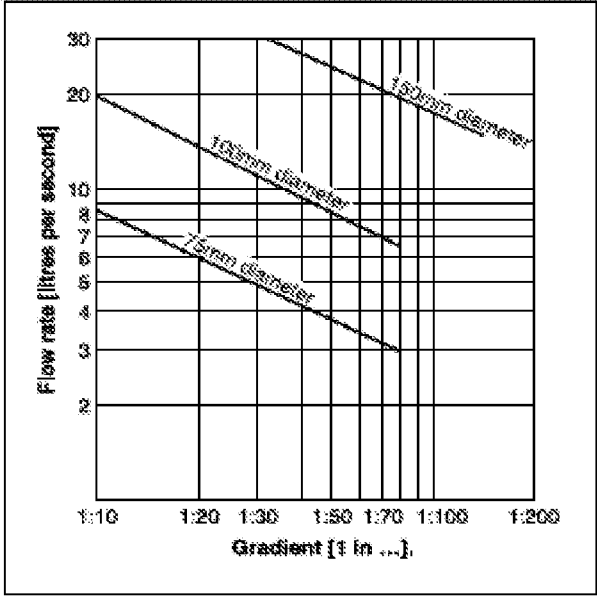


Table 6 Recommended minimum gradients for foul drains

Peak flow (litres/sec)	Pipe size (mm)	Minimum gradient (1 in ...)	Maximum capacity (litres/sec)
< 5	75	1:40	4.1
	100	1:40	9.2
> 5	75	1:60	2.8
	100	1:80*	6.3
	150	1:150†	15.0

Notes:

* Minimum of 1 W/C

† Minimum of 5 W/Cs

Table 10 Limits of cover for thermoplastics (nominal ring stiffness SN4) pipes in any width of trench

Nominal size	Laid in fields	Laid in light roads	Laid in main roads
100mm – 300mm	0.6m – 7m	0.9m – 7m	0.9m – 7m

Notes:

- For drains and sewers less than 1.5m deep and there is a risk of excavation adjacent to the drain and depth, special calculation is necessary, see BS EN 1295.
- All pipes assumed to be in accordance with the relevant standard listed in Table 7 with nominal ring stiffness SN4; other strengths and sizes of pipe are available, consult manufacturers.
- Bedding assumed to be Class S2 with 80% compaction and average soil conditions.
- Alternative designs using different pipe strengths and/or bedding types may offer more appropriate or economic options using the procedures set out in BS EN 1295.
- Minimum depth is set to 1.5m irrespective of pipe strength to cover loss of side support from parallel excavations.

		Project: Pound Place Angmering			
		Details: EXTRACTS OF BUILDING REGS			Project Number: 18 031
		Produced By: MP	Date: Mar-18	Checked By:	Date:
Ref.	Calculations				Output
RELEVANT EXTRACTS FROM APPROVED DOCUMENT H1 (as of May 2016)					
H1 FOUL DRAINAGE					
Table 12 Minimum dimensions for manholes					
Type	Size of largest pipe (DN)	Min. internal dimensions ¹		Min. clear opening size ³	
		Rectangular length and width	Circular diameter	Rectangular length and width	Circular diameter
Manhole					
< 1.5m deep to soffit	≤ 150	750 x 675 ⁷	1000 ⁷	750 x 675 ⁸	na ⁸
	225	1200 x 675	1200	1200 x 675 ⁸	
	300	1200 x 750	1200		
	>300	1800 x (DN+450)	The larger of 1800 or (DN+450)		
>1.5m deep to soffit	≤ 225	1200 x 1000	1200	800 x 800	800
	300	1200 x 1075	1200		
	375-450	1350 x 1225	1200		
	>450	1800 x (DN+775)	The larger of 1800 or (DN+775)		
Manhole shaft ⁴					
> 3.0m deep to soffit of pipe	Steps ⁵	1050 x 800	1050	800 x 800	800
	Ladder ⁶	1200 x 800	1200		
	Winch ⁸	900 x 800	900	800 x 800	800
Notes:					
1. Larger sizes may be required for manholes on bends or where there are junctions.					
2. May be reduced to 800 by 800 where required by highway loading considerations, subject to a safe system of work being specified.					
3. Not applicable due to working space needed.					
4. Minimum height of chamber in shafted manhole 2m from benching to underside of reducing slab.					
5. Min. clear space between ladder or steps and the opposite face of the shaft should be approximately 600mm.					
6. Winch only – no steps or ladders, permanent or removable.					
7. The minimum size of any manhole serving a sewer (i.e. any drain serving more than one property) should be 1200mm x 675mm rectangular or 1200mm diameter.					
Table 13 Maximum spacing of access points in metres					
From	To Access Fitting		To Junction	To Inspection chamber	To Manhole
	Small	Large			
Start of external drain ¹	12	12	–	22	45
Rodding eye	22	22	22	45	45
Access fitting: small 150 diam. and 150 x 100	–	–	12	22	22
large 225 x 100	–	–	22	45	45
Inspection chamber shallow	22	45	22	45	45
Manhole and inspection chamber deep	–	–	–	45	90 ²
Notes:					
1. Stack or ground floor appliance					
2. May be up to 800 for man-entry size drains and sewers					

	Project: Pound Place Angmering			
	Details: Foul Drainage Overview			Project Number: 18 031
	Produced By: MP	Date: Mar-18	Checked By: JB	Date: Mar-18
Ref.	Calculations			Output

FOUL WATER DRAINAGE FLOW RATES

BASED ON BS EN 752 - 4:1998

Type of Appliance	WC	Wash Hand Basin	Baths	Showers	Kitchen Sink	Washing Machine	Dish Washer
CARE HOME GF	40	42	2				
CARE HOME FF	41	43	2				
CARE HOME SF	3	3	0				
Total No. Provided	84	88	4	0	0	0	0
Typical Discharge Unit	1.8	0.3	0.6	0.4	0.6	0.6	0.6
Total Discharge Unit	151.2	26.4	2.4	0	0	0	0

TOTAL DISCHARGE UNITS FOR ALL APPLIANCES	180
FREQUENCY FACTOR FOR BUILDING USEAGE (Tb C1)	0.5
TOTAL UNATTENUATED FLOW, Q =	6.71 Litres/sec

Table C.1 — Typical frequency factors (k_{DU})

Type of building	k_{DU}
Dwelling, guesthouse, office (intermittent use)	0,5
Hospital, school, restaurant, hotel (frequent use)	0,7
Toilets and/or shower open to the public (congested use)	1,0
Laboratory buildings (special use)	1,2

Table C.2 — Typical values of discharge units (DU)

Type of appliance	DU
Washbasin, shower	0,3 to 0,6
Urinal	0,3 to 0,8
Bath, kitchen sink	0,8 to 1,3
Dishwasher	0,2 to 0,8
Household washing machine	0,5 to 0,8
Commercial washing machine	1,0 to 1,5
WCs (4,0 l to 9,0 l cistern)	1,2 to 2,5
Floor drains (DN 50 to DN 100)	0,6 to 2,0

The discharge unit will depend on the type of drainage system inside the building and the size of the appliance. Where no specific information is available, the higher value should be used.

$$Q = k_{DU} \sqrt{\sum DU} \quad (C.1)$$

where

- Q is the wastewater design flow rate, in litres per second;
- k_{DU} is a frequency factor, dimensionless;
- DU is the discharge unit (a characteristic value of the rate of wastewater outflow of a sanitary appliance), dimensionless.

Appendix H Proposed Plan of Site Drainage

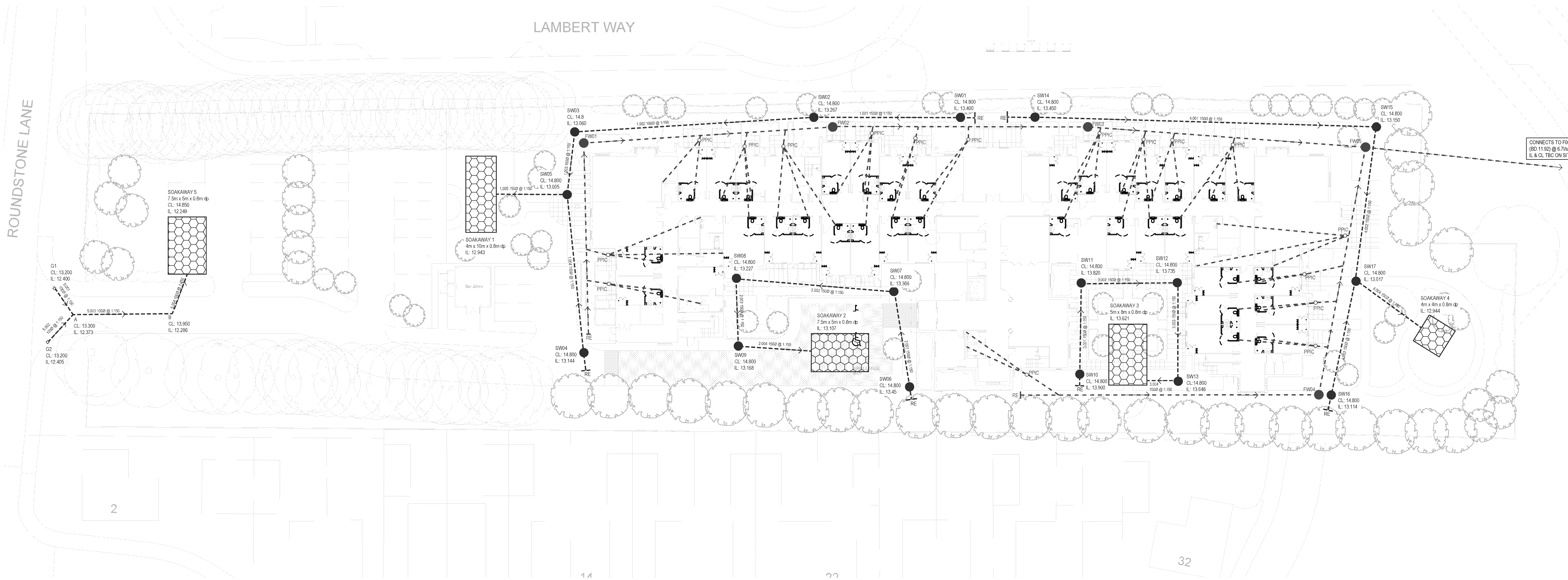
DO NOT SCALE

KEY:

- 150mm 1:100 FOLL WATER PIPE
225mm 1:100 SURFACE WATER PIPE
FWB BACKLAP MANHOLE
INDICATIVE LINE OF EXISTING SW SEWER
INDICATIVE LINE OF EXISTING FW SEWER
ACC DRAINAGE CHANNEL (BUILT IN SITU)
- SW1 SURFACE WATER MANHOLE
FW1 FOLL WATER MANHOLE
PPIC POLYPROPYLENE INSPECTION CHAMBER
CONNECTION TO EXISTING FW SEWER
EXISTING SW MANHOLE
RG ROAD GULLY
RE RODDING EYE
G GULLY
FW BACK INLET GULLY
BW BACK INLET GULLY
RWP RAINWATER PIPE
SVP SOIL VENT PIPE

General

- These rules are intended to supplement drawings and specifications. Where conflict of requirements exists the order of precedence shall be as shown in the specifications. Otherwise the architect's position shall prevail.
- This drawing is to be read in conjunction with all other relevant Engineers and Architects drawings.
- Drawings not to be scaled.
All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer and further instructions obtained before work is commenced.
- The structure is designed to be self-supporting and stable after the building is fully completed. It is the contractor's sole responsibility to determine the erection procedure and sequence and ensure that the building and its components are safe during erection. This includes the addition of whatever temporary bracing, girders or other items which may be necessary, such material remaining the property of the contractor upon completion.
- All work to comply with current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of Practice.



A	UPDATED TO SUIT REBUILT SITE LAYOUT	AC
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CLIENT: **hallmark**
CARE HOMES

PROJECT: PROPOSED CARE HOME
POUND PLACE
ROUNDSTONE ROAD
ANGMERING

TITLE: DRAINAGE PLAN

DRAWING STATUS: INFORMATION ONLY

DRAWN: AC DATE: MARCH 2018 CHECKED: MP DATE: MARCH 2018

SCALE @ A0: 1:200

DRAWING NO: 18 031 S500 REV: A

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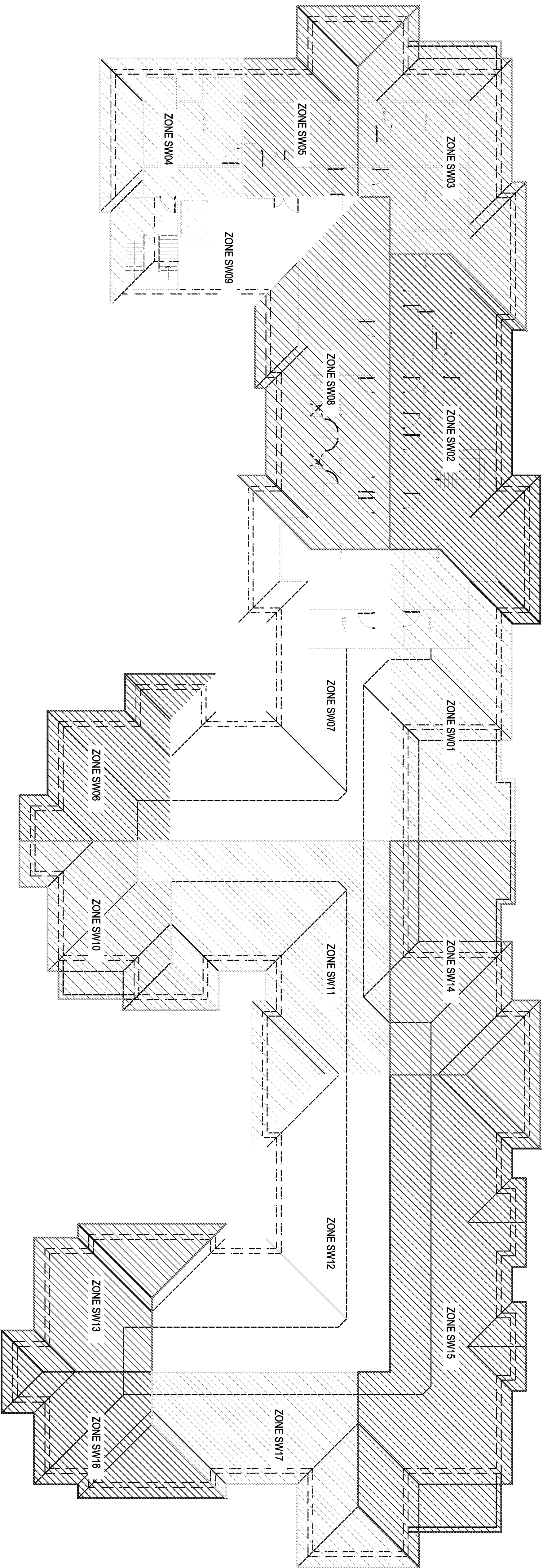
Appendix I Surface Water Key Plan of Catchment Areas
Drainage Calculations

DO NOT SCALE

For the avoidance of doubt, no approvals, reviews, comments or indication of satisfaction given by ARC Engineers in terms of subcontract drawings, products or proposed materials shall reduce or extinguish the obligation of the sub-contractor or supplier to adhere to the specification, general arrangement drawings, statutory requirements and good working practice. ARC Engineer's accept no liability for the selection of materials or workmanship in the execution of the works.

General

- These notes are intended to support lectures and specifications. Where conflict of requirements exists, the order of precedence shall be as shown in the specifications. Otherwise, no strictures provided shall prevail.
- The drawings to be used in conjunction with all other relevant Engineers and Architects drawings.
- Drawings not to be sealed.
- All dimensions to be checked on site by the contractor. Any discrepancies to be notified to the Engineer and further instructions obtained before work is commenced.
- The structure is designed to be self-supporting and stable after the building is completed. It is the contractor's sole responsibility to maintain the erection of the building. This includes the addition of whatever temporary bracing, props or tie-downs which may be necessary, such material remaining the property of the contractor upon completion.
- The building to comply with current building regulations and to be in accordance with the relevant British Standards and appropriate Codes of practice.



IMPERMEABLE ROOF AREAS
SCALE 1:150

IMPERMEABLE ROOF AREAS:			
ZONE	AREA (m²)	AREA (ha)	
SW01	134.4m²	0.01344ha	
SW02	168.7m²	0.01687ha	
SW03	143.6m²	0.01436ha	
SW04	96.9m²	0.00969ha	
SW05	86.5m²	0.00865ha	
SW06	82.5m²	0.00825ha	
SW07	221.6m²	0.02216ha	
SW08	162.4m²	0.01624ha	
SW09	771.5m²	0.00771ha	
SW10	85.4m²	0.00854ha	
SW11	193.8m²	0.01938ha	
SW12	200.3m²	0.02003ha	
SW13	82.4m²	0.00824ha	
SW14	136.9m²	0.01369ha	
SW15	266.7m²	0.02667ha	
SW16	79.0m²	0.00790ha	
SW17	116.3m²	0.01163ha	

-	INITIAL ISSUE	AC	29.03.2018
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care homes

PROJECT:

PROPOSED CARE HOME
POUND PLACE
ROUNDSTONE ROAD
ANGMERING

TITLE:

IMPERMEABLE ROOF AREAS

DRAWING STATUS:

INFORMATION ONLY			
DRAWN:	DATE:	CHECKED:	DATE:
AC	Mar-2018	MP	Mar-2018

1

DRAWING NO.

18 031 S501

Drainage Design Report

Flow

v6.0

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Network

Storm Network

Filename P:\2018\18031 - Pound Place\2. Design\Drainage\Surface Water Drainage\final sw drainage .pfd

Username APC\monwenna.parkin

Last analysed

05/04/2018 10:46:06

Report produced on

05/04/2018 10:51:07

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<http://support.causeway.com>

Rainfall Methodology	FSR
Return Period (years)	100
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Enforce best practice design rules	✓

Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓ SW01	0.013	5.50		14.800	Manhole	Adoptable	1200				1.400	
✓ SW02	0.017	5.50		14.800	Manhole	Adoptable	1200				1.533	
✓ SW03	0.014	5.50		14.800	Manhole	Adoptable	1200				1.740	
✓ SW04	0.010	5.50		14.800	Manhole	Adoptable	1200				1.656	
✓ SW05	0.009	5.50		14.800	Manhole	Adoptable	1200				1.785	
✓ SOAKAWAY 1				14.800	Manhole	Adoptable	1200				1.857	
✓ SW06	0.006	5.50		14.800	Manhole	Adoptable	1200				1.350	
✓ SW07	0.022	5.50		14.800	Manhole	Adoptable	1200				1.434	
✓ SW08	0.016	5.50		14.800	Manhole	Adoptable	1200				1.573	
✓ SW09	0.007	5.50		14.800	Manhole	Adoptable	1200				1.632	
✓ SOAKAWAY 2				14.800	Manhole	Adoptable	1200				1.693	
✓ SW10	0.009	5.50		14.800	Manhole	Adoptable	1200				0.900	
✓ SW11	0.019	5.50		14.800	Manhole	Adoptable	1200				0.980	
✓ SW12	0.020	5.50		14.800	Manhole	Adoptable	1200				1.065	
✓ SW13	0.008	5.50		14.800	Manhole	Adoptable	1200				1.152	
✓ SOAKAWAY 3				14.800	Manhole	Adoptable	1200				1.179	
✓ SW14	0.014	5.50		14.800	Manhole	Adoptable	1200				1.350	
✓ SW15	0.026	5.50		14.800	Manhole	Adoptable	1200				1.650	
✓ SW16	0.008	5.50		14.800	Manhole	Adoptable	1200				1.666	
✓ SW17	0.012	5.50		14.800	Manhole	Adoptable	1200				1.783	
✓ SOAKAWAY 4				14.800	Manhole	Adoptable	1200				1.856	
✓ G1	0.006	5.50		13.200	Manhole	Adoptable	1200				0.600	
✓ G2	0.005	5.50		13.200	Manhole	Adoptable	1200				0.795	
✓ A				13.300	Manhole	Adoptable	1200				0.927	
✓ B				13.950	Manhole	Adoptable	1200				1.684	
✓ SOAKAWAY 5				14.850	Manhole	Adoptable	1200				2.601	

Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)	Con Offset (m)	Min DS IL (m)
1 001	SW01	SW02	20.000	0.600Cobbrough White		13.400	13.207	0.193	150.0	150.0	150Crossover	5.41	50.0		
1 002	SW02	SW03	31.000	0.600Cobbrough White		13.287	13.000	0.287	150.0	150.0	150Crossover	8.04	50.0		
1 003	SW03	SW05	8.300	0.600Cobbrough White		13.000	13.000	0.000	150.0	150.0	150Crossover	8.21	50.0		
1 004	SW04	SW05	20.800	0.600Cobbrough White		13.144	13.000	0.144	150.0	150.0	150Crossover	5.43	50.0		
1 005	SW05	SOAKAWAY 1	9.300	0.600Cobbrough White		13.100	12.940	0.060	150.0	150.0	150Crossover	6.40	50.0		
2 001	SW06	SW07	12.600	0.600Cobbrough White		13.450	13.386	0.064	150.0	150.0	150Crossover	5.25	50.0		
2 002	SW07	SW08	20.800	0.600Cobbrough White		13.360	13.227	0.133	150.0	150.0	150Crossover	5.08	50.0		
2 003	SW08	SW09	8.900	0.600Cobbrough White		13.274	13.186	0.088	150.0	150.0	150Crossover	5.98	50.0		
2 004	SW09	SOAKAWAY 2	9.200	0.600Cobbrough White		13.160	13.107	0.053	150.0	150.0	150Crossover	6.05	50.0		
3 001	SW10	SW11	12.000	0.600Cobbrough White		13.900	13.820	0.080	150.0	150.0	150Crossover	6.24	50.0		
3 002	SW11	SW12	12.700	0.600Cobbrough White		13.820	13.750	0.069	150.0	150.0	150Crossover	6.50	50.0		
3 003	SW12	SW13	13.000	0.600Cobbrough White		13.738	13.840	0.097	150.0	150.0	150Crossover	6.77	50.0		
3 004	SW13	SOAKAWAY 3	4.000	0.600Cobbrough White		13.940	13.891	0.047	148.1	148.1	150Crossover	8.25	50.0		
4 001	SW14	SW15	45.000	0.600Cobbrough White		13.400	13.150	0.250	150.0	150.0	150Crossover	8.90	50.0		
4 002	SW15	SW17	20.000	0.600Cobbrough White		13.100	13.017	0.083	150.0	150.0	150Crossover	8.20	50.0		
4 003	SW16	SW17	14.600	0.600Cobbrough White		13.114	13.017	0.097	150.0	150.0	150Crossover	8.20	50.0		
4 004	SW17	SOAKAWAY 4	11.000	0.600Cobbrough White		13.017	12.946	0.073	150.0	150.0	150Crossover	8.30	50.0		
5 001	G1	A	4.688	0.600Cobbrough White		12.400	12.373	0.027	150.0	150.0	150Crossover	5.11	50.0		
5 002	G2	A	4.768	0.600Cobbrough White		12.405	12.373	0.032	150.0	150.0	150Crossover	5.13	50.0		
5 003	A	B	13.600	0.600Cobbrough White		12.378	12.238	0.097	150.0	150.0	150Crossover	5.47	50.0		
5 004	B	SOAKAWAY 5	5.580	0.600Cobbrough White		12.286	12.240	0.047	150.0	150.0	150Crossover	5.62	50.0		

Name	US Node	DS Node	Vel (m/s)	Cap (ft)	Flow (ft)	US Depth (ft)	DS Depth (ft)	Minimum Depth (ft)	Maximum Depth (ft)	I Area (ft)	E Add Inflow (ft)	Pro Depth (ft)	Pro Velocity (ft)	Notes
3.001	SW001	SW002	1.15	14.5	1.8	1.250	1.250	1.250	1.250	0.013	0.0	0.0	0.000	0.000
3.002	SW002	SW003	1.15	14.5	4.0	1.350	1.350	1.350	1.350	0.030	0.0	0.0	0.000	0.000
3.003	SW003	SW004	1.15	14.5	8.0	1.450	1.450	1.450	1.450	0.045	0.0	0.0	0.000	0.000
3.004	SW004	SW005	1.15	14.5	1.2	1.500	1.500	1.500	1.500	0.010	0.0	0.0	0.000	0.000
3.005	SW005	SW006	1.15	14.5	8.0	1.600	1.600	1.600	1.600	0.045	0.0	0.0	0.000	0.000
3.006	SW006	SW007	1.15	14.5	1.0	1.650	1.650	1.650	1.650	0.008	0.0	0.0	0.000	0.000
3.007	SW007	SW008	1.15	14.5	4.0	1.700	1.700	1.700	1.700	0.030	0.0	0.0	0.000	0.000
3.008	SW008	SW009	1.15	14.5	6.2	1.750	1.750	1.750	1.750	0.045	0.0	0.0	0.000	0.000
3.009	SW009	SW010	1.15	14.5	7.2	1.800	1.800	1.800	1.800	0.050	0.0	0.0	0.000	0.000
3.010	SW010	SW011	1.15	14.5	1.0	1.850	1.850	1.850	1.850	0.008	0.0	0.0	0.000	0.000
3.011	SW011	SW012	1.15	14.5	3.0	1.900	1.900	1.900	1.900	0.020	0.0	0.0	0.000	0.000
3.012	SW012	SW013	1.15	14.5	6.4	1.950	1.950	1.950	1.950	0.040	0.0	0.0	0.000	0.000
3.013	SW013	SW014	1.15	14.5	7.5	2.000	2.000	2.000	2.000	0.050	0.0	0.0	0.000	0.000
3.014	SW014	SW015	1.15	14.5	1.0	2.050	2.050	2.050	2.050	0.010	0.0	0.0	0.000	0.000
3.015	SW015	SW016	1.15	14.5	5.4	2.100	2.100	2.100	2.100	0.040	0.0	0.0	0.000	0.000
3.016	SW016	SW017	1.15	14.5	1.0	2.150	2.150	2.150	2.150	0.008	0.0	0.0	0.000	0.000
3.017	SW017	SW018	1.15	14.5	5.0	2.200	2.200	2.200	2.200	0.040	0.0	0.0	0.000	0.000
3.018	SW018	SW019	1.15	14.5	1.0	2.250	2.250	2.250	2.250	0.008	0.0	0.0	0.000	0.000
3.019	SW019	SW020	1.15	14.5	4.0	2.300	2.300	2.300	2.300	0.030	0.0	0.0	0.000	0.000
3.020	SW020	SW021	1.15	14.5	1.8	2.350	2.350	2.350	2.350	0.010	0.0	0.0	0.000	0.000
3.021	SW021	SW022	1.15	14.5	4.0	2.400	2.400	2.400	2.400	0.030	0.0	0.0	0.000	0.000
3.022	SW022	SW023	1.15	14.5	1.8	2.450	2.450	2.450	2.450	0.010	0.0	0.0	0.000	0.000
3.023	SW023	SW024	1.15	14.5	1.8	2.500	2.500	2.500	2.500	0.010	0.0	0.0	0.000	0.000
3.024	SW024	SW025	1.15	14.5	1.8	2.550	2.550	2.550	2.550	0.010	0.0	0.0	0.000	0.000
3.025	SW025	SW026	1.15	14.5	1.8	2.600	2.600	2.600	2.600	0.010	0.0	0.0	0.000	0.000
3.026	SW026	SW027	1.15	14.5	1.8	2.650	2.650	2.650	2.650	0.010	0.0	0.0	0.000	0.000
3.027	SW027	SW028	1.15	14.5	1.8	2.700	2.700	2.700	2.700	0.010	0.0	0.0	0.000	0.000
3.028	SW028	SW029	1.15	14.5	1.8	2.750	2.750	2.750	2.750	0.010	0.0	0.0	0.000	0.000
3.029	SW029	SW030	1.15	14.5	1.8	2.800	2.800	2.800	2.800	0.010	0.0	0.0	0.000	0.000
3.030	SW030	SW031	1.15	14.5	1.8	2.850	2.850	2.850	2.850	0.010	0.0	0.0	0.000	0.000
3.031	SW031	SW032	1.15	14.5	1.8	2.900	2.900	2.900	2.900	0.010	0.0	0.0	0.000	0.000

Link ID	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node ID	Dia (mm)	Width (mm)	Node Type	RH Type	DS Node ID	Dia (mm)	Width (mm)	Node Type	RH Type
1.001	20.000	1:50.0	150.0	1500mmx1500mm	14.800	13.400	1.200	14.800	13.250	1.300	SW01	1200	3600	Manhole	Sub-pipe	SW02	1200	3600	Manhole	Sub-pipe
1.002	31.000	1:50.0	150.0	1500mmx1500mm	14.800	13.300	1.200	14.800	13.200	1.300	SW01	1200	3600	Manhole	Sub-pipe	SW03	1200	3600	Manhole	Sub-pipe
1.003	5.300	1:50.0	150.0	1500mmx1500mm	14.800	13.080	1.500	14.800	13.200	1.600	SW03	1200	3600	Manhole	Sub-pipe	SW05	1200	3600	Manhole	Sub-pipe
1.004	20.000	1:50.0	150.0	1500mmx1500mm	14.800	13.140	1.300	14.800	13.000	1.400	SW03	1200	3600	Manhole	Sub-pipe	SW05	1200	3600	Manhole	Sub-pipe
1.005	9.300	1:50.0	150.0	1500mmx1500mm	14.800	13.200	1.800	14.800	13.200	1.700	SW05	1200	3600	Manhole	Sub-pipe	SOANAWAY 1	1200	3600	Manhole	Sub-pipe
2.001	12.000	1:50.0	150.0	1500mmx1500mm	14.800	13.400	1.200	14.800	13.200	1.200	SW05	1200	3600	Manhole	Sub-pipe	SW07	1200	3600	Manhole	Sub-pipe
2.002	20.800	1:50.0	150.0	1500mmx1500mm	14.800	13.300	1.200	14.800	13.270	1.400	SW07	1200	3600	Manhole	Sub-pipe	SW08	1200	3600	Manhole	Sub-pipe
2.003	8.900	1:50.0	150.0	1500mmx1500mm	14.800	13.120	1.400	14.800	13.000	1.400	SW08	1200	3600	Manhole	Sub-pipe	SW09	1200	3600	Manhole	Sub-pipe
3.001	9.200	1:50.0	150.0	1500mmx1500mm	14.800	13.100	1.400	14.800	13.000	1.300	SW09	1200	3600	Manhole	Sub-pipe	SOANAWAY 2	1200	3600	Manhole	Sub-pipe
3.002	12.000	1:50.0	150.0	1500mmx1500mm	14.800	13.000	0.700	14.800	13.000	0.700	SW09	1200	3600	Manhole	Sub-pipe	SW11	1200	3600	Manhole	Sub-pipe
3.003	12.700	1:50.0	150.0	1500mmx1500mm	14.800	13.020	0.700	14.800	13.100	0.700	SW11	1200	3600	Manhole	Sub-pipe	SW12	1200	3600	Manhole	Sub-pipe
3.004	13.000	1:50.0	150.0	1500mmx1500mm	14.800	13.100	0.700	14.800	13.100	0.700	SW12	1200	3600	Manhole	Sub-pipe	SW13	1200	3600	Manhole	Sub-pipe
4.001	4.000	1:45.1	145.1	1450mmx1450mm	14.200	13.240	1.000	14.200	13.220	0.700	SW13	1200	3600	Manhole	Sub-pipe	SOANAWAY 3	1200	3600	Manhole	Sub-pipe
4.002	45.000	1:50.0	150.0	1500mmx1500mm	14.800	13.200	1.200	14.800	13.100	1.500	SW13	1200	3600	Manhole	Sub-pipe	SW15	1200	3600	Manhole	Sub-pipe
4.003	20.000	1:50.0	150.0	1500mmx1500mm	14.800	13.100	1.300	14.800	13.000	1.800	SW15	1200	3600	Manhole	Sub-pipe	SW17	1200	3600	Manhole	Sub-pipe
4.004	14.800	1:50.0	150.0	1500mmx1500mm	14.800	13.140	1.500	14.800	13.000	1.800	SW17	1200	3600	Manhole	Sub-pipe	SW17	1200	3600	Manhole	Sub-pipe
5.001	11.000	1:50.0	150.0	1500mmx1500mm	14.800	13.000	1.800	14.800	13.000	1.700	SW17	1200	3600	Manhole	Sub-pipe	SOANAWAY 4	1200	3600	Manhole	Sub-pipe
5.002	4.090	1:50.0	150.0	1500mmx1500mm	13.200	12.400	0.700	13.200	12.300	0.900	SW17	1200	3600	Manhole	Sub-pipe	A	1200	3600	Manhole	Sub-pipe
5.003	4.700	1:50.0	150.0	1500mmx1500mm	13.200	12.400	0.800	13.200	12.300	0.900	SW17	1200	3600	Manhole	Sub-pipe	B	1200	3600	Manhole	Sub-pipe
5.004	13.000	1:50.0	150.0	1500mmx1500mm	13.200	12.370	0.800	13.200	12.300	1.500	SW17	1200	3600	Manhole	Sub-pipe	SOANAWAY 5	1200	3600	Manhole	Sub-pipe
6.004	5.300	1:50.0	150.0	1500mmx1500mm	13.800	12.800	1.500	14.800	12.100	2.300	SW17	1200	3600	Manhole	Sub-pipe	SW17	1200	3600	Manhole	Sub-pipe

Node ID	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Node Type	MH Type	Link ID	IL (m)	Dia (mm)	Link Type
SW01			14.800	1.400	1200		Manhole	Adaptable				
									0 1.001	13.400	150 Circular	
SW02			14.800	1.533	1200		Manhole	Adaptable	1 1.001	13.267	150 Circular	
SW03			14.800	1.740	1200		Manhole	Adaptable	0 1.002	13.267	150 Circular	
									1 1.002	13.080	150 Circular	
									0 1.003	13.000	150 Circular	
SW04			14.800	1.656	1200		Manhole	Adaptable				
									0 1.004	13.144	150 Circular	
SW05			14.800	1.795	1200		Manhole	Adaptable	1 1.004	13.000	150 Circular	
									2 1.003	13.000	150 Circular	
									0 1.005	13.000	150 Circular	
SOAKAWAY 1			14.800	1.857	1200		Manhole	Adaptable	1 1.005	12.940	150 Circular	
SW06			14.800	1.350	1200		Manhole	Adaptable				
									0 2.001	13.450	150 Circular	
SW07			14.800	1.434	1200		Manhole	Adaptable	1 2.001	13.300	150 Circular	

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SW14	14.800	1.350	1200	Manhole	Adaptable				
						0	4.001	13.450	150Circular
SW15	14.800	1.650	1200	Manhole	Adaptable	1	4.001	12.150	150Circular
						0	4.002	13.150	150Circular
SW16	14.800	1.680	1200	Manhole	Adaptable				
						0	4.003	13.114	150Circular
SW17	14.800	1.783	1200	Manhole	Adaptable	1	4.003	13.017	150Circular
						2	4.002	13.017	150Circular
						0	4.004	13.017	150Circular
SOAKAWAY 4	14.800	1.850	1200	Manhole	Adaptable	1	4.004	12.944	150Circular
G1	13.200	0.800	1200	Manhole	Adaptable				
						0	5.001	12.400	100Circular
G2	13.200	0.795	1200	Manhole	Adaptable				
						0	5.002	12.400	100Circular
A	13.300	0.927	1200	Manhole	Adaptable	1	5.002	12.373	100Circular
						2	5.001	12.373	100Circular
						0	5.003	12.373	100Circular

B		13.950	1.664	1.000	Manhole	Autopipe	1	5.003	12.286	100Crusher
							0	5.004	12.298	100Crusher
SOAKAWAY 5		14.850	2.601	1.000	Manhole	Autopipe	1	5.004	12.249	100Crusher

Rainfall Methodology	FSR	Return Period (years)	Climate Change (%)
FSR Region	England and Wales	10	40
M5-60 (mm)	20,000	100	40
Ratio-R	0.400		
Summer CV	0.750		
Winter CV	0.840		
Analysis Speed	Normal		
Drain Down Time (mins)	240		
Additional Storage (m ³ /ha)	0.0		
Storm Durations (mins)	15		
	30		
	60		
	120		
	180		
	240		
	360		
	480		
	600		
	720		
	960		
	1440		
Check Discharge Rate(s)	✓		
1 year (l/s)	0.3		
30 year (l/s)	0.7		
100 year (l/s)	1.0		
Check Discharge Volume	✓		
100 year +40% 360 minute (m ³)	46		

Site Makeup	Greenfield
Greenfield Method	H124
Positively Drained Area (ha)	0.323
SAAR (mm)	720
Soil Index	2
SPR	0.30
Region	7
Growth Factor 1 year	0.85
Growth Factor 30 years	2.40
Growth Factor 100 years	3.19
Betterment (%)	50
QBar	0.6
Q 1 year (l/s)	0.3
Q 30 year (l/s)	0.7
Q 100 year (l/s)	1.0

Site Makeup	Greenfield
Greenfield Method	FSR/FEH
Positively Drained Area (ha)	0.323
Soil Index	2
SPR	0.30
CWI	108.148
Return Period (years)	100
Climate Change (%)	40
Storm Duration (mins)	360
Betterment (%)	50
PR	0.325
Runoff Volume (m3)	46

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Default Values		Overrides							
Entry Loss (manhole)	0.250								
Exit Loss (manhole)	0.250								
Entry Loss (junction)	0.000								
Exit Loss (junction)	0.000								
Flood Risk (m)	0.300								

Node Size	✓
Node Losses	✓
Link Size	✓
Minimum Diameter (mm)	150
Link Length	✓
Maximum Length (m)	100 000
Coordinates	✓
Accuracy (m)	1.000
Crossings	✓
Cover Depth	✓
Minimum Cover Depth (m)	
Maximum Cover Depth (m)	3.000
Backdrops	✓
Minimum Backdrop Height (m)	
Maximum Backdrop Height (m)	1.500
Full Bore Velocity	✓
Minimum Full Bore Velocity (m/s)	
Maximum Full Bore Velocity (m/s)	3.000
Proportional Velocity	✓
Return Period (years)	
Minimum Proportional Velocity (m/s)	0.750
Maximum Proportional Velocity (m/s)	3.000
Surcharged Depth	✓
Return Period (years)	
Maximum Surcharged Depth (m)	0.100
Flooding	✓
Return Period (years)	30
Discharge Rates	✓
1 year (l/s)	
30 year (l/s)	
100 year (l/s)	
Discharge Volume	✓

100 year 360 minute (m ³)	
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Results for 10 year +40% Critical Storm Duration. Lowest mass balance: 98.75%

Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	SW01	84	13.512	0.112	1.5	0.1267	0.00000K		1.001	SW02	1.5	0.381	0.104	0.3172	
120 minute winter	SW02	84	13.512	0.245	3.5	0.2770	0.00000K		1.002	SW03	3.5	0.499	0.242	0.5457	
120 minute winter	SW03	86	13.511	0.431	5.2	0.5101	0.00000K		1.003	SW05	4.6	0.458	0.319	0.1461	
120 minute winter	SW04	95	13.511	0.397	1.2	0.4148	0.00000K		1.004	SW05	1.0	0.198	0.087	0.3979	
120 minute winter	SW05	88	13.511	0.508	8.9	0.5719	0.00000K		1.005	SOAKAWAY 1	6.3	0.781	0.435	0.1637	
120 minute winter	SOAKAWAY 1	86	13.510	0.587	6.3	11.9780	0.00000K		Infiltration		1.8				
15 minute winter	SW06	12	13.502	0.052	3.1	0.0591	0.00000K		2.001	SW07	3.1	0.357	0.217	0.1308	
15 minute winter	SW07	11	13.499	0.133	11.4	0.1505	0.00000K		2.002	SW05	10.0	0.657	0.694	0.3549	
15 minute winter	SW08	11	13.495	0.208	18.0	0.2358	0.00000K		2.003	SW09	15.4	0.875	1.055	0.1587	
15 minute winter	SW09	11	13.444	0.179	17.9	0.1889	0.00000K		2.004	SOAKAWAY 2	17.7	1.413	1.224	0.1594	
30 minute winter	SOAKAWAY 2	24	13.257	0.153	14.8	5.7842	0.00000K		Infiltration		7.8				
15 minute winter	SW10	12	13.865	0.095	3.1	0.0741	0.00000K		3.001	SW11	3.0	0.384	0.211	0.1476	
15 minute winter	SW11	10	13.961	0.141	10.3	0.1599	0.00000K		3.002	SW12	8.9	0.813	0.812	0.2211	
15 minute winter	SW12	12	13.925	0.199	16.1	0.2152	0.00000K		3.003	SW13	15.8	0.896	1.091	0.2298	
15 minute winter	SW13	12	13.810	0.162	16.7	0.1835	0.00000K		3.004	SOAKAWAY 3	16.4	1.528	1.265	0.0894	
30 minute winter	SOAKAWAY 3	23	13.788	0.147	15.2	8.0613	0.00000K		Infiltration		8.0				
15 minute winter	SW14	10	13.511	0.061	5.3	0.0594	0.00000K		4.001	SW15	5.1	0.458	0.354	0.5482	
15 minute winter	SW15	12	13.488	0.253	15.0	0.2821	0.00000K		4.002	SW17	12.1	0.732	0.836	0.3521	
15 minute winter	SW16	13	13.310	0.198	3.1	0.2228	0.00000K		4.003	SW17	2.2	0.238	0.152	0.2570	
15 minute winter	SW17	13	13.303	0.291	17.8	0.3294	0.00000K		4.004	SOAKAWAY 4	17.0	1.188	1.177	0.1937	
30 minute winter	SOAKAWAY 4	24	13.228	0.284	14.0	4.8659	0.00000K		Infiltration		9.5				
15 minute winter	G1	11	12.458	0.055	2.3	0.0655	0.00000K		5.001	A	2.2	0.431	0.443	0.0231	
15 minute winter	G2	11	12.480	0.055	2.3	0.0618	0.00000K		5.002	A	2.2	0.443	0.451	0.0280	
15 minute winter	A	11	12.451	0.078	4.4	0.0881	0.00000K		5.003	B	4.4	0.674	0.882	0.0850	
15 minute summer	B	9	12.378	0.093	4.2	0.1052	0.00000K		5.004	SOAKAWAY 5	4.4	1.156	0.894	0.0218	
120 minute winter	SOAKAWAY 5	80	12.315	0.068	1.4	2.3483	0.00000K		Infiltration		0.4				

Results for 100 year +40% Critical Storm Duration. Lowest mass balance: 99.75%															
Event	US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute winter	SW001	110	14.479	1.079	2.6	1.2209	0.0000	3.0000	1.001	SW002	2.3	0.402	0.157	0.3521	
120 minute winter	SW002	110	14.479	1.212	5.5	1.3711	0.0000	3.0000	1.002	SW003	5.1	0.477	0.350	0.9457	
120 minute winter	SW003	110	14.479	1.418	7.9	1.5036	0.0000	3.0000	1.003	SW005	7.4	0.469	0.511	0.1461	
120 minute winter	SW004	110	14.477	1.333	2.6	1.5077	0.0000	3.0000	1.004	SW005	1.5	0.198	0.106	0.1679	
120 minute winter	SW005	110	14.477	1.472	10.7	1.6848	0.0000	3.0000	1.005	SOAKAWAY 1	10.3	0.858	0.710	0.1637	
120 minute winter	SOAKAWAY 1	110	14.475	1.532	10.3	17.7426	0.0000	OK	Infiltration		2.3				
15 minute winter	SW006	12	13.935	0.465	5.0	0.5483	0.0000	3.0000	2.001	SW007	4.7	0.357	0.323	0.2218	
15 minute winter	SW007	12	13.925	0.599	16.2	0.6327	0.0000	3.0000	2.002	SW008	15.1	0.856	1.042	0.3862	
15 minute winter	SW008	12	13.747	0.523	24.2	0.5976	0.0000	3.0000	2.003	SW009	23.2	1.317	1.604	0.1567	
15 minute winter	SW009	12	13.544	0.376	27.3	0.4249	0.0000	3.0000	2.004	SOAKAWAY 2	26.3	1.497	1.822	0.1620	
30 minute winter	SOAKAWAY 2	25	13.349	0.242	22.1	9.3442	0.0000	OK	Infiltration		12.6				
15 minute winter	SW010	12	14.366	0.466	5.0	0.5266	0.0000	3.0000	3.001	SW011	4.7	0.368	0.326	0.2113	
15 minute winter	SW011	12	14.356	0.536	14.6	0.6067	0.0000	3.0000	3.002	SW012	13.8	0.786	0.957	0.2216	
15 minute winter	SW012	12	14.256	0.523	25.1	0.5916	0.0000	3.0000	3.003	SW013	24.3	1.364	1.662	0.2289	
15 minute winter	SW013	12	13.959	0.311	28.7	0.3519	0.0000	3.0000	3.004	SOAKAWAY 3	28.2	1.603	1.940	0.0704	
30 minute winter	SOAKAWAY 3	24	13.861	0.243	23.6	9.8356	0.0000	OK	Infiltration		13.0				
15 minute winter	SW014	12	13.949	0.499	8.6	0.5641	0.0000	3.0000	4.001	SW015	6.9	0.456	0.476	0.7922	
15 minute winter	SW015	12	13.982	0.732	22.3	0.6282	0.0000	3.0000	4.002	SW017	18.6	1.058	1.238	0.3521	
15 minute winter	SW016	13	13.633	0.519	5.0	0.5874	0.0000	3.0000	4.003	SW017	3.3	0.246	0.227	0.2570	
15 minute winter	SW017	13	13.627	0.610	26.1	0.6901	0.0000	3.0000	4.004	SOAKAWAY 4	26.3	1.527	1.860	0.1937	
30 minute winter	SOAKAWAY 4	24	13.410	0.466	23.2	7.5983	0.0000	OK	Infiltration		15.5				
15 minute winter	G1	12	12.577	0.177	3.6	0.2092	0.0000	3.0000	5.001	A	3.2	0.435	0.658	0.0321	
15 minute winter	G2	12	12.579	0.174	3.6	0.1967	0.0000	3.0000	5.002	A	3.2	0.446	0.658	0.0373	
15 minute winter	A	12	12.562	0.169	6.5	0.2139	0.0000	3.0000	5.003	B	6.2	0.794	1.254	0.1617	
15 minute winter	B	7	12.414	0.128	6.2	0.1449	0.0000	3.0000	5.004	SOAKAWAY 5	6.2	1.096	1.256	0.0361	
120 minute winter	SOAKAWAY 5	92	12.361	0.112	2.4	4.3415	0.0000	OK	Infiltration		0.7				